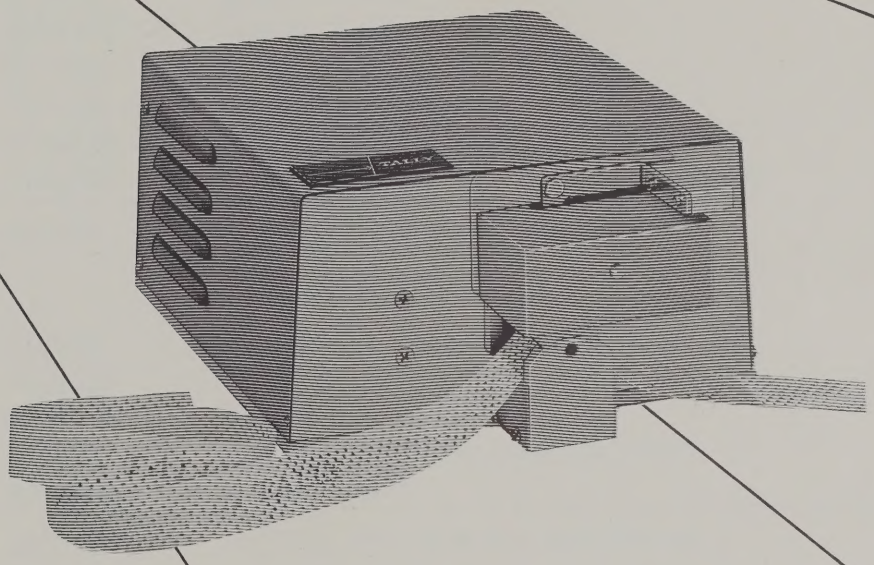
TALLY CORPORATION

READER MANUAL

464

TAPE READER Model 1593 Serial #67A2270 Date 7-5-67



SO 464 — Revision C

October, 1966

TALLY CORPORATION • 1310 MERCER STREET SEATTLE, WASHINGTON 98109

The Tally Model 1593 Tape Reader is basically a standard Model 464PR 24-Volt reader which has been modified to operate in a horizontal (rather than upright) position. The unit is equipped with 7-1/2 inch reels and has specially flanged rollers to accommodate horizontal-plane reeling. The Fuse Holder (Part Number 4089270) and its fuse (Part Number 4100900) have been deleted.

The 464 Instruction Manual is applicable to the Model 1593 after the following changes are made to the manual and to its parts lists. Tension arm positioning instructions (below) replace those on page 14 of the manual. Figure 1 of this addendum replaces Figure 18 of the manual. The wiring diagram, Figure 2 of this addendum, replaces Figure 30 of the manual.

Figure Number	Index Number	Part Number	Description	Replaces
22	10	303900	Panel	519653
22	30	329380	Chassis	519640
22	38	144821	Bracket, Connector	225360
22	11	346270	Tape Control Assembly, R. H.	345470
22	24	346271	Tape Control Assembly, L. H.	345471
27	9	350010	Roller	345520
--	--	305810	Spacer, Motor	Addition
--	--	4098300	Clamp, Cable, 1/2" I. D.	Addition
--	--	4097910	Clamp, Cable, 1/4" I. D.	Addition
--	--	307610	Label, Identification	Addition
--	--	4158520	Screw, #6-32 x 3/16", Round Head	Addition
--	--	4166200	Screw, #8-32 x 3/4", Black, Flat Head	Addition
22	36	320000	Suppression Network Assembly	313670
			CONSISTING OF:	
		310840	Component Mounting Board	
		4111320	Terminal Lug	
		4028100	Resistor, 25 Ω, 25 W	
		4009505	Capacitor, 150 µf, 50 WVDC (NP)	
		4057800	Diode, SS875	
--	--	320010	MODEL 1593 WIRING DIAGRAM: See Figure 2 of this addendum	Figure 30

TENSION ARM POSITIONING (Refer to Figure 1 of this addendum)

When the tension arm is at "rest" position (brake ON) the arm should be within 1/4 ± .06 inches from the bottom edge of the panel.

When the tension arm is moved upward, set the spring tension in the reeling mechanism to provide a pull of 270 ± 20 grams when the center line of the farthest roller from the arm pivot is 2 ± .06 inches from the bottom edge of the panel. Position the tension link parallel to the bottom of the reeling mechanism frame when the desired adjustment is achieved. Tighten all set screws.

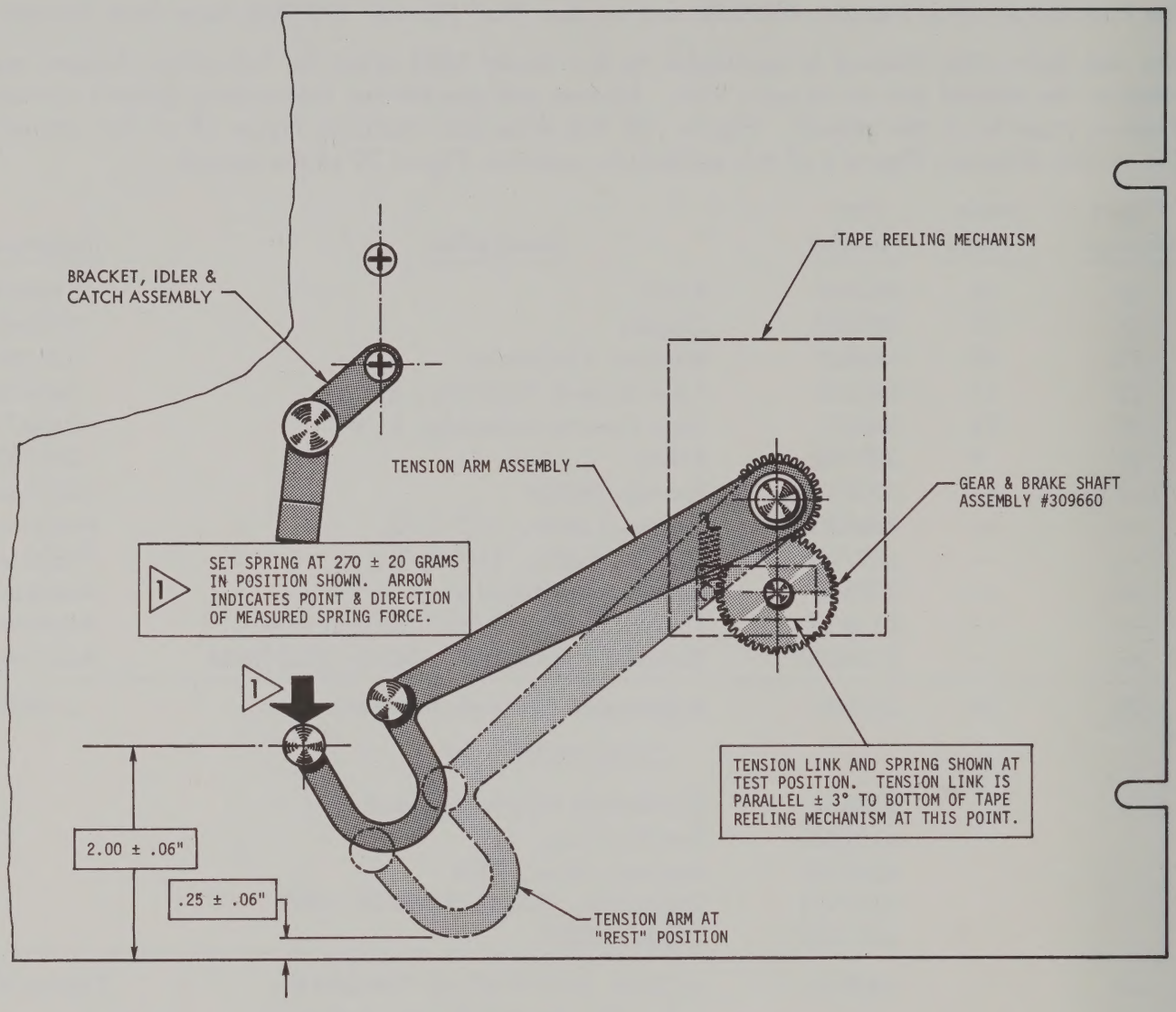
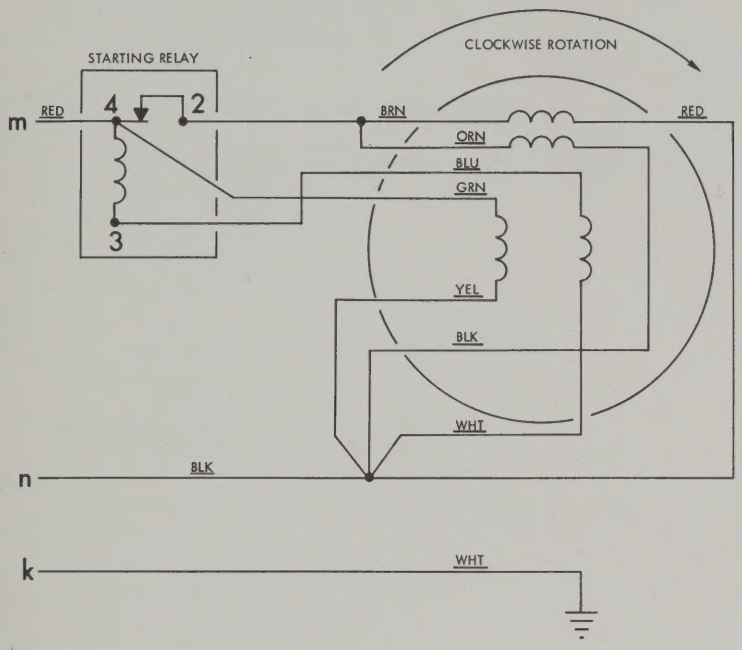
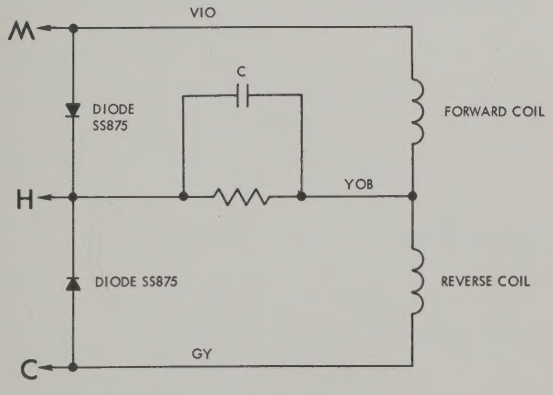

BRACKET, IDLER & CATCH ASSEMBLY
TAPE REELING MECHANISM
TENSION ARM ASSEMBLY
GEAR & BRAKE SHAFT ASSEMBLY #309660
1
SET SPRING AT 270 ± 20 GRAMS IN POSITION SHOWN. ARROW INDICATES POINT & DIRECTION OF MEASURED SPRING FORCE.
1
TENSION LINK AND SPRING SHOWN AT TEST POSITION. TENSION LINK IS PARALLEL ± 3° TO BOTTOM OF TAPE REELING MECHANISM AT THIS POINT.
2.00 ± .06"
.25 ± .06"
TENSION ARM AT "REST" POSITION

Figure 1



DIODE SUPPRESSION NETWORK
R - 25Ω 25W C - 150μf, 50V



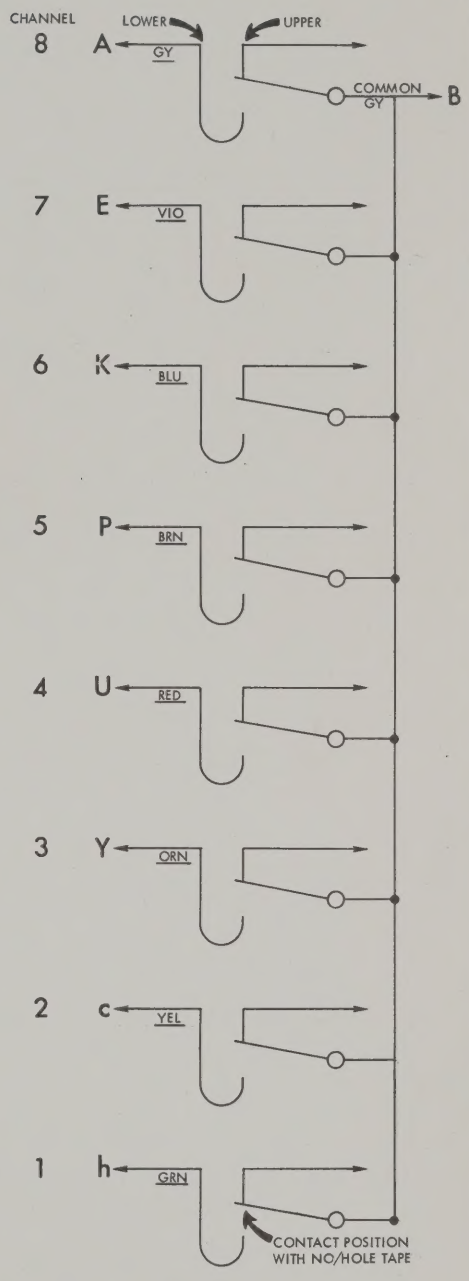


Figure 2

Wiring Diagram

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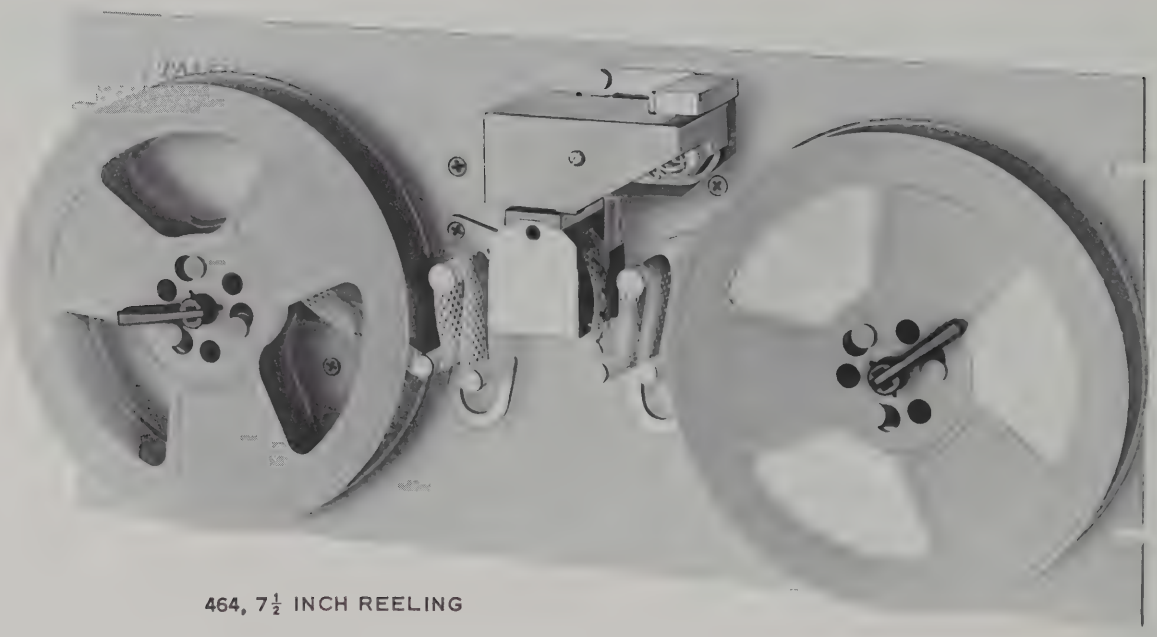
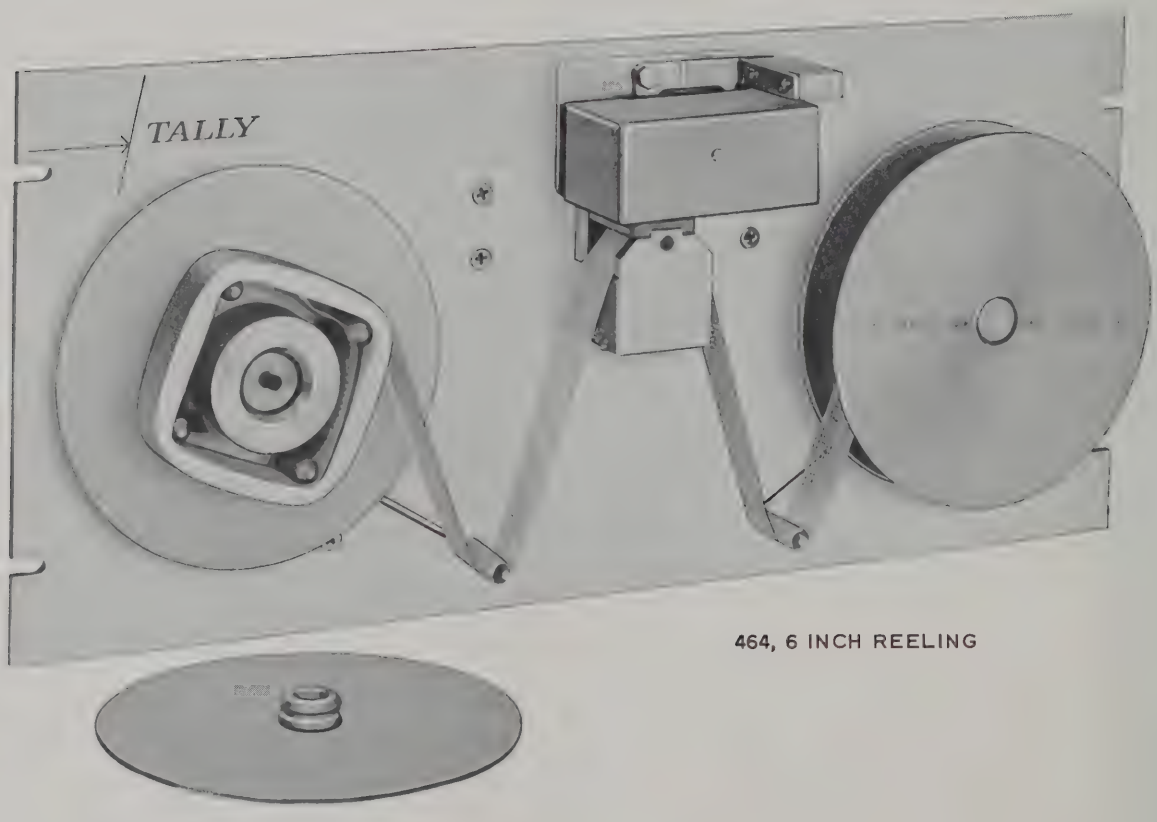


464, 7½ INCH REELING



464, 6 INCH REELING

Figure 1
Model 464 Tape Readers

INTRODUCTION

The Tally Model 464 Tape Reader reads any standard five to eight level perforated tape asynchronously at speeds up to 120 characters per second in either direction of tape feed. Tape wear is exceptionally low, and standard tape may be re-read many times. The Model 464 senses both the absence and presence of tape holes, thus giving positive hole/space identification.

Drive power is supplied to the capstan from an integrally mounted 1/12 HP motor through a bevel gear and differential drive assembly. The use of special clutches in the drive assembly permits high speed response for bi-directional tape movement.

The Model 464 is available in three styles: 464C (console), 464P (panel) and 464PR (panel, with reel tape handling).

Model	Width	Height	Depth	Weight
464 Console	8 5/8"	4 7/8"	11 1/4"	12 lbs.
464 Panel	19"	8 3/4"	8 3/4"	12 lbs.
464 Panel Reeling	19"	8 3/4"	8 3/4"	15 lbs.

Environmental Limitations

The unit is designed for continuous operation in a temperature range of 50 to 110° Fahrenheit at 20 to 85 percent relative humidity, as long as no temperature humidity combination produces condensation.

Input Requirements

The drive motor requires 105 to 125 or 220 to 240 volts A.C., 60 ± 1/4 or 50 ± 1/4 cps.* Run amperage is 0.4 amperes. To move the tape, a 3.0 ± 0.25 millisecond D.C. pulse (rise time less than 0.5 millisecond) of 48 or 24 volts ± 10% (according to customer specifications) is applied to either the forward or reverse escapement assembly. One pulse must be supplied for each movement of the tape.

* Different pulley ratios are required to change from 60 cps to 50 cps. See parts list, General Assembly, page 22.

Any of the several modes of controlling tape movement and reading may be adopted. For example, tape movement and reading can be controlled by separate pulses, or different bit levels can be read by separate pulses. Normally, the same pulse that advances the tape also interrogates the read contacts.

If individual pulse sources are used for tape movement and reading, all pulses must be simultaneous within ± 0.25 millisecond. At maximum reading rate of 120 characters per second, the drive pulses are 8.3 milliseconds apart (leading edge to leading edge).

Tape Handling

The Model 464PR is supplied with bi-directional tape reeling equipment mounted on either side of the read head. The tape reels are rotated by a differential gear and brake mechanism actuated by geared tape control arms. Both mechanisms are driven by belts from the capstan drive assembly. Since the units are bi-directional, either reel can be the take-up or the supply side, depending upon the direction of tape movement. Slack on the supply reel is taken up through the action of the tape control arms.

The Model 464PR can be supplied with one of two types of reels. Six inch metal reels with a demountable front flange are available, as are completely removable 7 1/2 inch plastic reels. See page 35 for parts changes from six inch to 7 1/2 inch reeling.

INSTRUCTIONS FOR USE

Paper Tape Standards and Channel Identification

This reader is designed to read any perforated tape that has been prepared within the ASA specifications. For standard dimensions, refer to Figure 2.

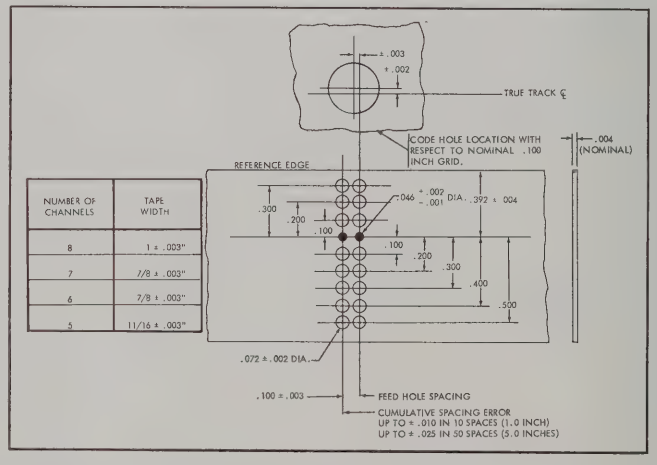


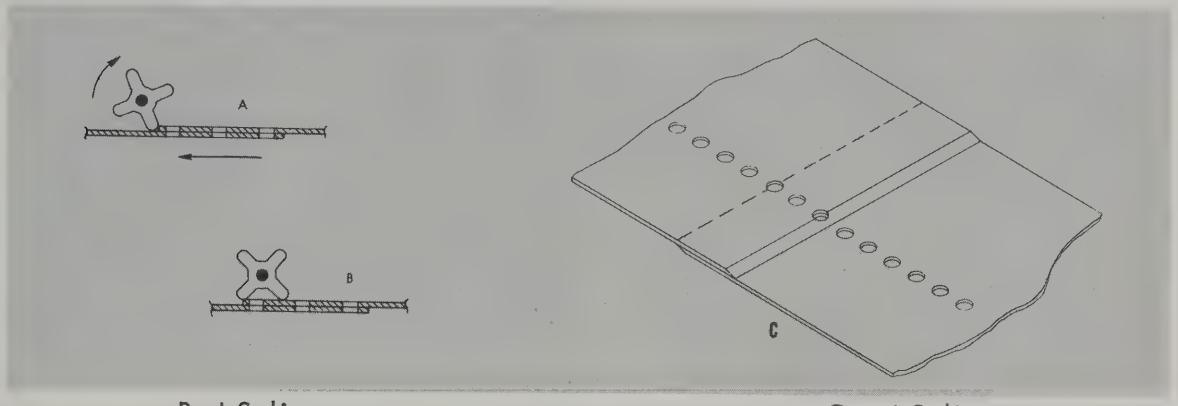
Figure 2
Paper Tape Standards

Tape Splicing

It is best to splice tape outside of data on leader. This eliminates the possibility of mis-reading caused by an imperfect splice. Cut the tape straight across the center of the sprocket hole. Taper both ends with sandpaper or a fingernail board.

Apply a light coat of contact cement (Goodyear "Pliobond," or equivalent) to the tape ends. Overlap the tape two character spaces, as shown in Figure 3. If normal reading is from right to left, the lower end of the tape should be to the right of the splice. Be sure that sprocket holes in the splice line up correctly. Allow the cement to dry, and sand the joint smooth.

If for any reason splicing in data is necessary, the preferable method is to use a tape splicer incorporating "all hole" adhesive-backed mylar splicing patches. The Donauld Company, P.O. Box 104, Ridgewood, New Jersey, manufactures such a device.



Bad Splice Good Splice

Figure 3
Tape Splices

Reel Belts

When installing reel belts, see that both run parallel to the front panel, as shown in Figure 4. Improper installation will cause undue belt wear. Pulley adjustment is initially performed at the factory.

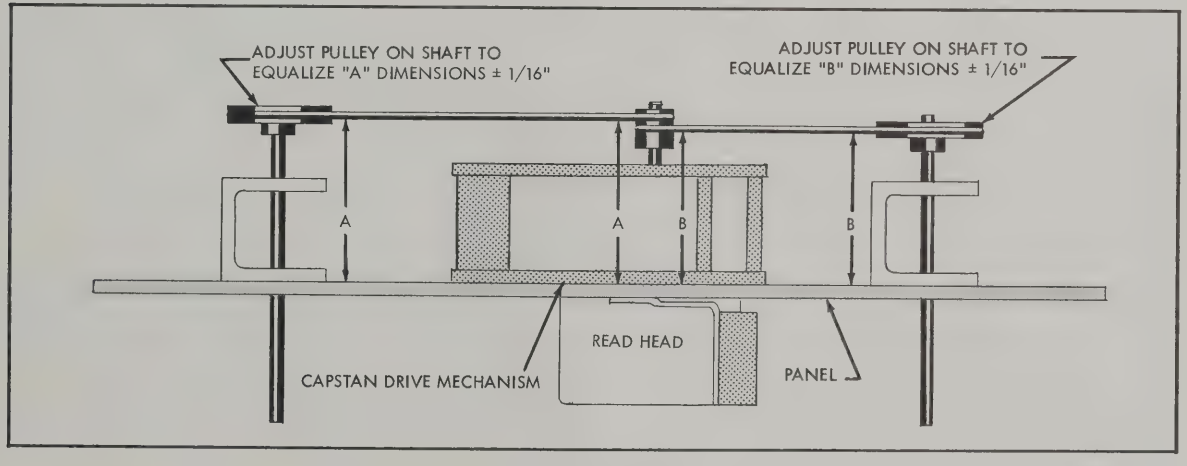


Figure 4
Reel Belt Alignment

Threading Tape —7½-Inch Reeling

To thread the 7 1/2 inch Model 464, raise the lift lever to a fully open position. Lift both tape control arms up until they snap firmly into the Nylon catches directly below the idler rollers. Be sure that you lift the arms with your fingertips under the "U" section of the arm until the latch-up is achieved.

> CAUTION: Do not lift either arm by grasping the rollers, and do not pull the arm away from the catch to either latch-up or release the tape control arms.

The unit is now in "load" position. Route the tape by the supply reel to the take-up reel — through both sets of rollers — making sure that the sprocket side of the tape is nearest you. Close the lift lever onto the tape, and press both catches to release the tape control arms. The arms will assume a position as shown in Figure 5.

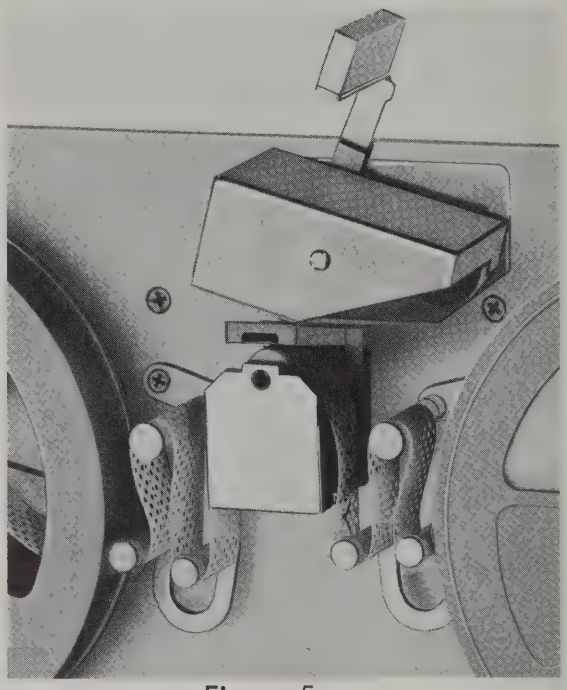


Figure 5
Threading Tape, 7 1/2-Inch Reeling

6-Inch Reeling

To thread a tape through the read head, raise the lift lever handle. This raises the read head so the capstan is clear. Lay the tape across the capstan so that the pins project through the holes of a data channel. Also be certain that the tape is threaded with the three-hole nearest the operator. While holding the tape in position on the capstan, push the lift lever down until it locks in place. The tape is now properly threaded, and the reader is ready for use.

Figure 6
Threading Tape, Six-Inch Reeling

Tape Read Head

Tape wrap on the capstan is approximately 120 degrees. This retards elongation of sprocket holes in tapes that must be read many times. The strippers on either side of the capstan prevent further tape wrap.

Perforations (holes) in the tape are sensed by the four-point star wheels. Spring pressure applied to the star wheel lever by each pair of movable contacts (Figure 7A) holds the star wheel lightly against the tape, but with sufficient pressure to avoid contact bounce.

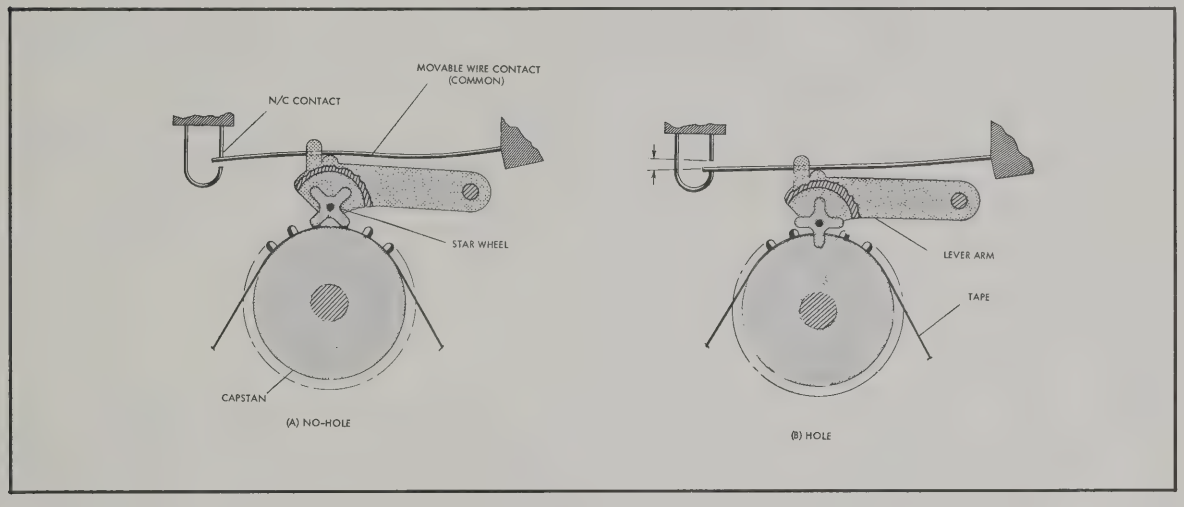


Figure 7
Star Wheels Reading Perforated Tape

As shown in Figure 7A, when a no-hole condition is sensed, the star wheel rides the tape on two of its points, and the movable contact is switched to the upper, normally closed (N/C) position. When a hole is sensed (with the tape moving in either direction), one of the star wheel points drop through the hole as shown in Figure 7B, and the movable contact is switched downward to the normally open (N/O) position.

Therefore, an electric pulse delivered to the movable contact wire (common) will be conducted to the N/C terminal if a no-hole is sensed or to the N/O terminal if a hole is sensed.

By definition, the normally closed (N/C) contact is that contact which is closed when the star wheel reads a no-hole condition on the tape. The normally open (N/O) contact is closed when the star wheel reads a hole in the tape.

Motor and Capstan Drive

Drive power is transmitted from the motor by a lug belt and pulleys to the input shaft with bevel gear (3) through the two idler bevel gears (1 and 10) and to the two clutch assemblies (4 and 7). When the tape is not being moved, an armature on each of two escapement assemblies (2 and 12) engages a tooth of the escapement wheel on the corresponding clutch assembly, causing the clutches to slip. When the tape is to be advanced (capstan rotation counter-clockwise), an electric pulse energizes the electromagnet on the forward escapement assembly (12), disengaging the armature from the escapement wheel and permitting the forward clutch assembly to rotate. Rotation of the clutch assembly transfers torque from the clutch through the differential (5 and 6) to the capstan shaft (8). When the escapement coil is de-energized, allowing the armature to drop and engage the next tooth of the escapement wheel, the capstan is stopped in position to read the next character.

Release of the reverse clutch assembly will cause clockwise rotation of the capstan, moving the tape in the reverse direction.

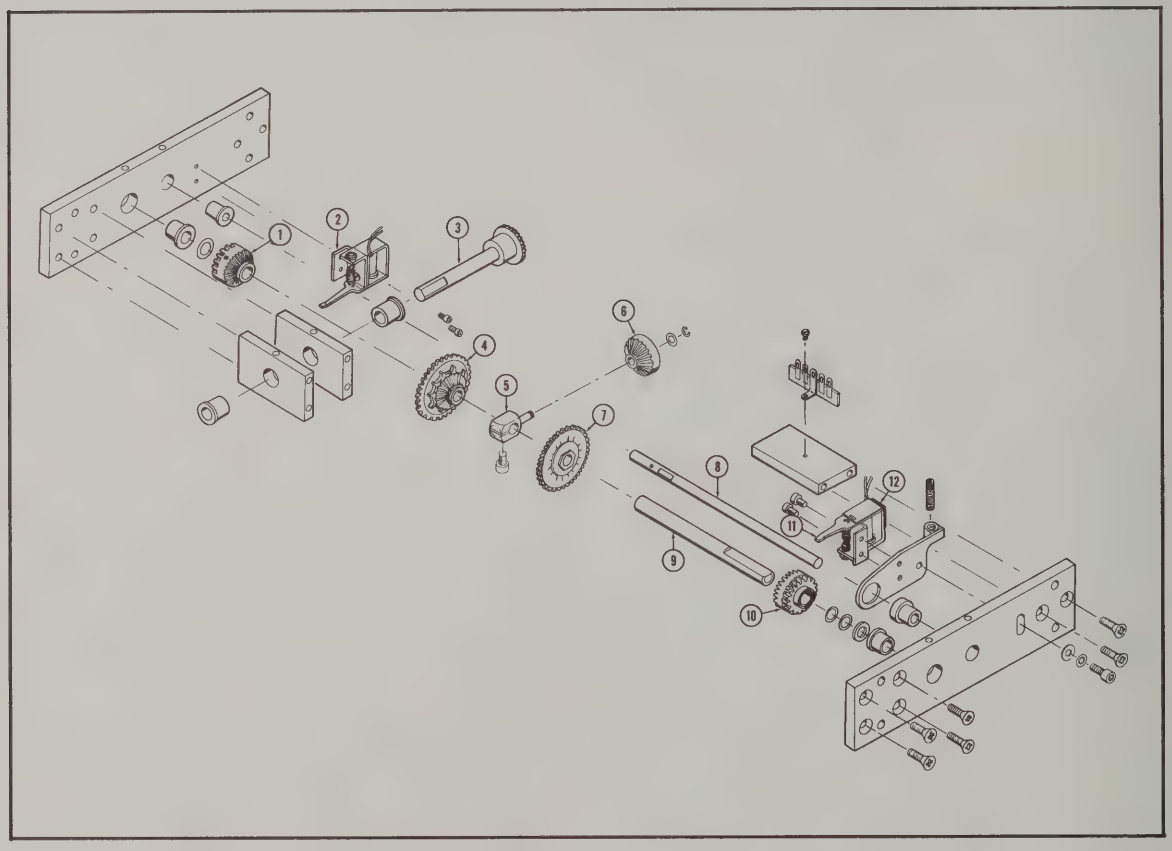


Figure 8
Exploded View,
Capstan Drive Mechanism

ELECTRICAL OPERATION

Escapement Operation

To advance the tape (capstan rotation counter-clockwise), a drive pulse is applied to the forward escapement assembly. The energized electromagnet disengages the armature from the escapement wheel, allowing the clutch assembly to rotate. Similarly, the tape may be moved in the reverse direction by pulsing the reverse escapement assembly. The escapement coils are either 24 or 48 volts, according to customer specifications. Refer to Suppression, page 8, for coil resistance and inducatance.

Switching Action

Switches in each of the eight channels may be "read" by introducing a pulse to the common (movable) contact. If a pulse is transmitted through the normally closed (N/C) contacts to the output, the tape does not have a hole in that particular read position. On the other hand, if the pulse is transmitted to the output through the normally open (N/O) contacts, a hole is sensed.

Timing

The following discussion and the timing diagram are based on (1) a maximum reading rate of 120 characters per second, (2) a drive motor speed of 1,725 rpm, and (3) a drive pulse of 24 or 48 volts amplitude and 3.0 milliseconds duration. Under these conditions, the minimum time duration of one cycle is 8.3 milliseconds; i.e., drive pulses must be at least 8.3 milliseconds apart (leading edge to leading edge).

Figure 17 shows the timing relationships and pulse duration requirements of the Model 464 Tape Reader. To start a cycle, a pulse is applied to either electromagnet, which momentarily disengages the armature from the escapement wheel in the clutch assembly. Torque is transmitted to the capstan shaft until the armature engages the following tooth. This torque moves the capstan one space in either direction, depending upon which escapement was pulsed.

As the tape is moved over the capstan, it is read by the star wheels. If no holes are read, the movable contacts will remain in the normally closed position. When a hole in the tape is read, the movable wire contacts for that particular channel are transferred from the normally closed to the normally open position. However, due to the mechanical delay designed into the reader, contact switching occurs between four and 7.5 milliseconds after the drive pulse has been applied. This permits "dry" or current-free switching, which gives long contact life.

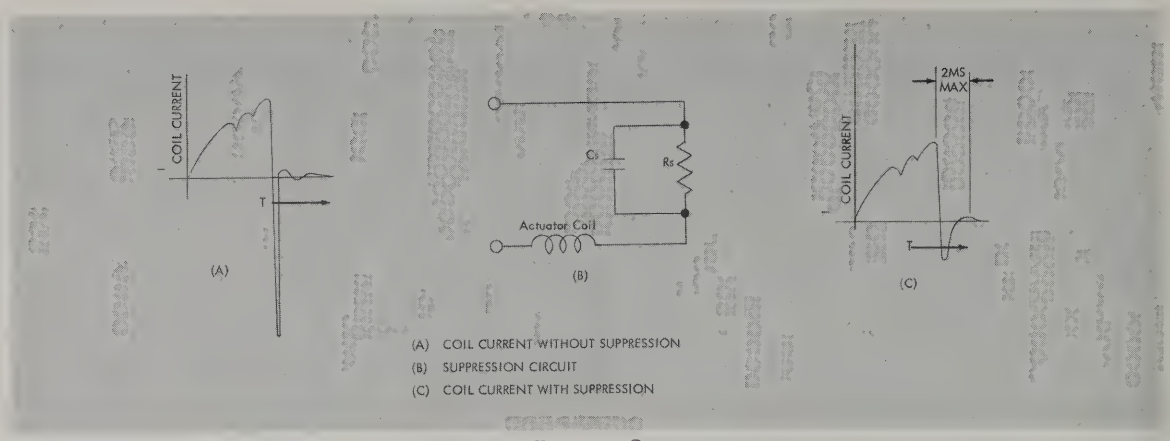


Figure 9
Suppression Diagram

Suppression

Suppression, if provided to protect control contact, must be designed so that the coil current transient becomes zero within two milliseconds after opening the control contacts. See Figure 9. Optimum suppression is effected with the following RC network:

Coil Resistance	Drive Pulse	Resistance	Capacitance
50Ω	48 V	68Ω	20 µf
8Ω	24 V	25Ω	150 µf

Contact Ratings

In normal usage, the same pulse that advances the tape is used to interrogate the contacts. As shown on the timing diagram, contact make or break always occurs after the expiration of the drive-interrogate pulse. Pulse-gated contacts must conduct a minimum of 6 volts and 50 milliamperes (or a maximum of 30 volts and one ampere) with a minimum interrogate time of 100 microseconds for either condition.

When the contacts are live switched, they must conduct a minimum of 6 volts and five milliamperes (or a maximum of 30 volts and 15 milliamperes) with a minimum interrogate time of 100 microseconds for either condition.

For maximum reading reliability, assertive logic should be used so that during the interrogate period, any contact closure greater than five microseconds is accepted as a valid test.

Terminations

All power input, escape pulses and read pulses are delivered to the Model 464 Tape Reader through a 34 pin plug. Connections to each terminal are shown on the wiring diagram, Figure 30. A mating receptacle is provided with the reader. Other connectors are optional at extra cost.

ROUTINE MA

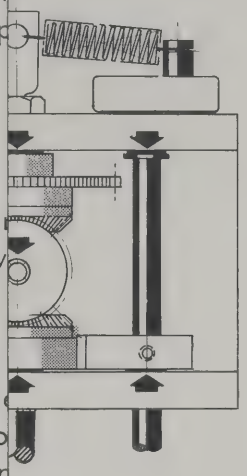
The following maintenance can be perfor
tion kit -- plus two small brushes -- by p
the unit.

Cleaning

Remove the cover from the front panel.
them with a soft brush, taking extreme ca
tacts. Clean lint and hair from the star w

Read Head Service

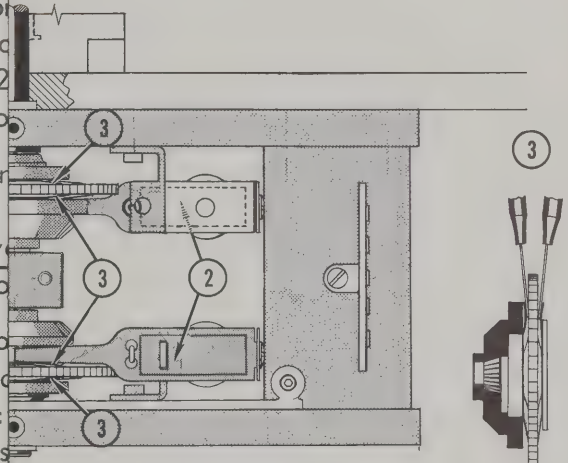
Lint and dust is a major cause of reading
include a thorough and conscientious cl
Star wheels may sometimes be jammed, o
dust. Use extreme care when cleaning ir
and are usually more effective than most



e 10
n Points,
echanism

Lubrication

Lubrication of the Model 464 is not us
Although lubrication of the unit can be p
generally followed at 250-hour intervals.



(1) After every 250 hours of operatio
If the reader is equipped with to
drive mechanism bearings every 2
LUBRICANT: Bardahl BOA 30, o

(2) After every 250 hours of operatio
adjacent pole face; add three or
felt pad oil reservoir. Do not ov
LUBRICANT: Bardahl BOA 30, o

(3) After every 250 hours of operatio
clutch assembly. Insert the tip
the driven gear and the fiber fric
lubricant are sufficient for each s
LUBRICANT; Silicone Fluid, 350

LUBRICANT MEASURE

In order to insure some control during lubrication, a standard
dard measure assures that approximately the correct amount o

DROP -- A drop is that amount which forms into a "bea
mulated weight) from the injector end of the syringe, at

e 11
n Points,
e Mechanism

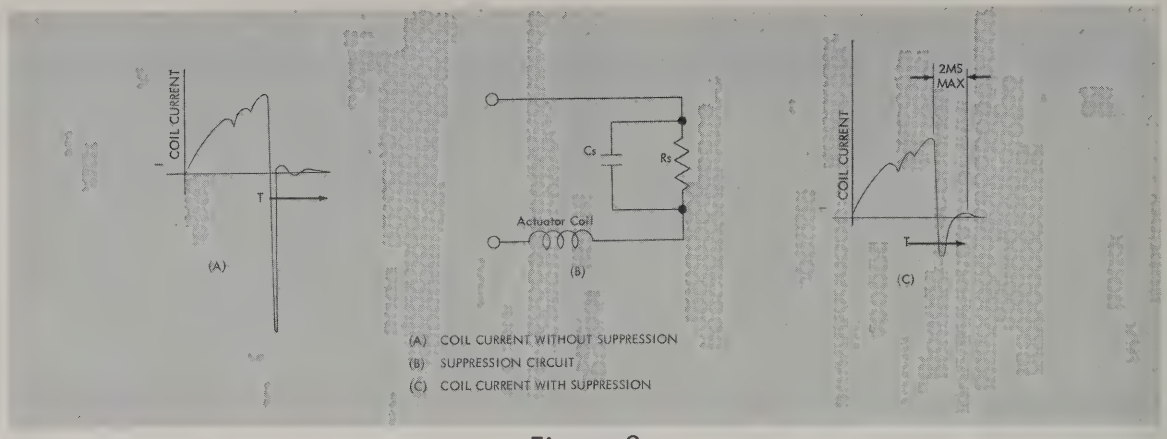


Figure 9
Suppression Diagram

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ROUTINE MAINTENANCE

The following maintenance can be performed with the tools provided in the lubrication kit -- plus two small brushes -- by personnel with no specialized knowledge of the unit.

Cleaning

Remove the cover from the front panel. If inspection shows dirty contacts, clean them with a soft brush, taking extreme care to avoid bending the small movable contacts. Clean lint and hair from the star wheels. See also Contact Cleaning, page 10.

Read Head Service

Lint and dust is a major cause of reading errors. Routine maintenance should always include a thorough and conscientious cleaning to prevent an accumulation of dirt. Star wheels may sometimes be jammed, or their free movement impeded by line and dust. Use extreme care when cleaning in this area. Light air blasts are preferable and are usually more effective than most cleaning implements.

Lubrication

Lubrication of the Model 464 is not usually a requisite of routine maintenance. Although lubrication of the unit can be performed by the operator, this procedure is generally followed at 250-hour intervals.

(1) After every 250 hours of operation, lubricate shaft and idler gear bearings. If the reader is equipped with tape reeling equipment, lubricate the reel drive mechanism bearings every 250 hours.
LUBRICANT: Bardahl BOA 30, or equivalent.

(2) After every 250 hours of operation, wipe each escapement armature and the adjacent pole face; add three or four drops of lubricant to the armature's felt pad oil reservoir. Do not over-lubricate.
LUBRICANT: Bardahl BOA 30, or equivalent.

(3) After every 250 hours of operation lubricate both sides of each escapement clutch assembly. Insert the tip of the oiling syringe in 1/4 inch between the driven gear and the fiber friction washer. Four equally spaced drops of lubricant are sufficient for each side.
LUBRICANT; Silicone Fluid, 350cs (Dow Corning 200, or equivalent).

LUBRICANT MEASURE

In order to insure some control during lubrication, a standard quantity for applying lubricant has been established. This standard measure assures that approximately the correct amount of lubricant will be applied. This measure is defined as follows:

DROP -- A drop is that amount which forms into a "bead" which becomes heavy enough to drop (of its own accumulated weight) from the injector end of the syringe, at an average room temperature of 70°.

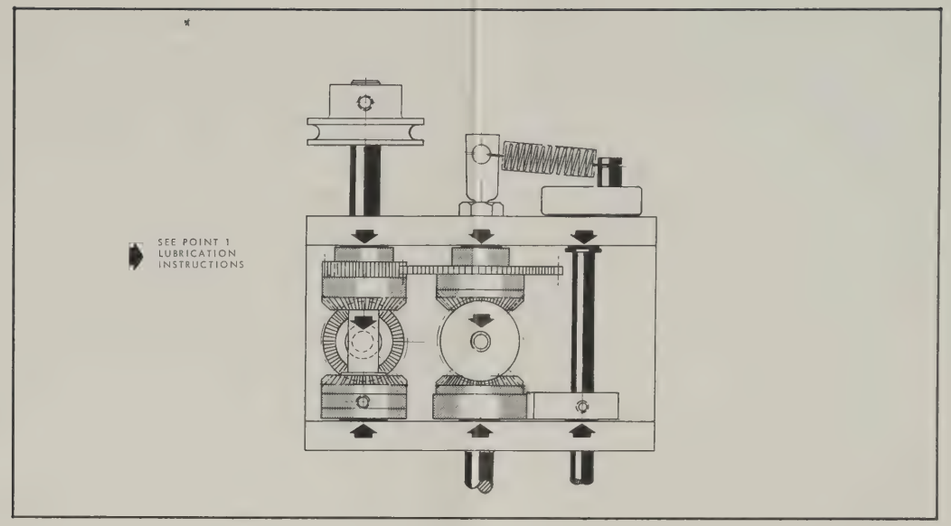


Figure 10
Lubrication Points,
Reeling Mechanism

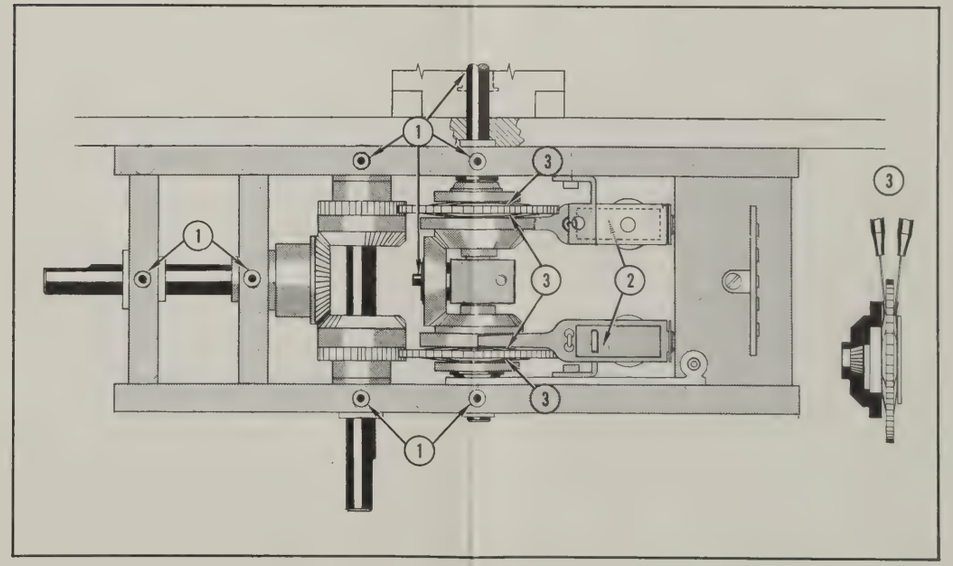


Figure 11
Lubrication Points,
Capstan Drive Mechanism

CORRECTIVE MAINTENANCE

CAUTION: The following maintenance requires special tools and some familiarity with the unit.

Contact Cleaning

Access to the read head contacts is obtained by removing the cover from the panel. If the contacts are dirty or corroded, clean them with methyl ethyl ketone. Use a fine brush or pipe cleaner as the applicator, and dry with compressed air. Use caution to avoid bending the small movable contact wires.

Keep the star wheels and star wheel levers free of lint and hair. They must have free movement to read tape without error. If lever movement becomes sticky, clean the pivot bearings with methyl ethyl ketone, and relubricate with Bardahl Oil Additive, SAE 30.

Read Head and Contact Adjustment

Reading errors may be caused by incorrect adjustment of the read head assembly. The first step in adjustment is to verify that each of the eight star wheel levers is free to move without drag on the adjacent levers.

The star wheels must also be centered over the capstan, as seen in Figure 7. The star wheel position (with respect to the center of the capstan) may be adjusted horizontally by loosening the pivot bushing "A" and moving the read head adjusting eccentric "B", as shown in Figure 12.

Note: Two eccentric positions are possible for centering the star wheels. Use the one in which the eccentric's true center is high.

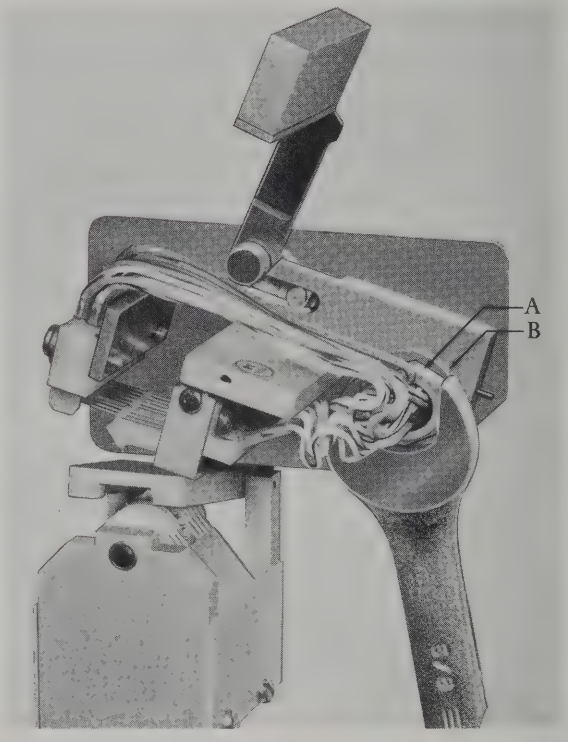


Figure 12
Read Head Adjustment

Movable Contacts

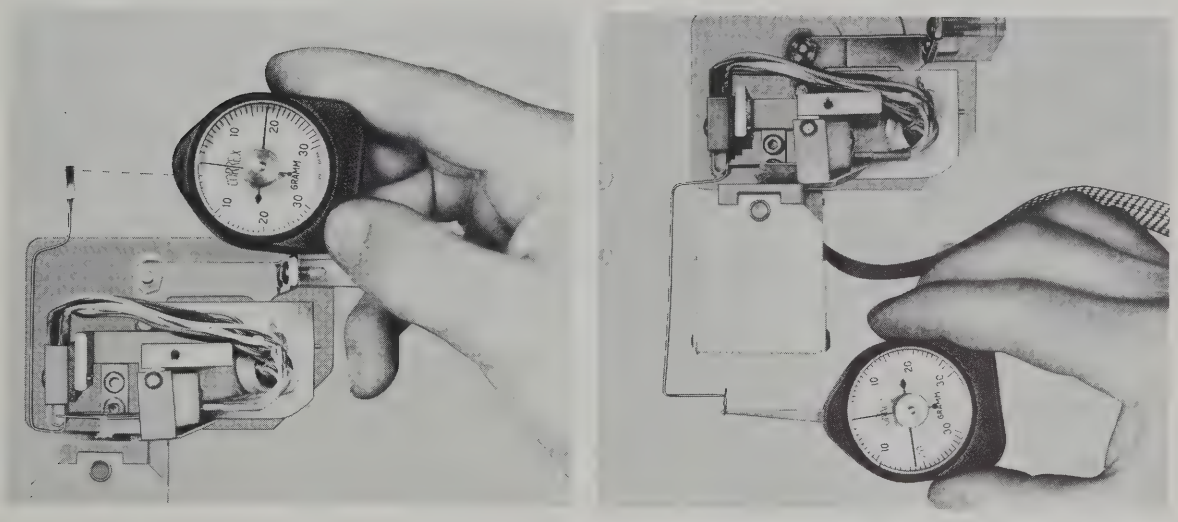
The movable contact wires must be free to move up and down in the gap between the fixed contacts. Improper alignment may be corrected by carefully forming the movable contact wire at its base.

Fixed Contacts

The fixed contact gap opening must be between .025 and .030 inches wide. Excessive gap may be corrected by forming the normally open (lower) contact.

Contact Pressure

Contact pressure should be 10-20 grams per pair of wires when in either the N/O or N/C position. Lower contact (N/O) pressure may be checked by applying force under the wires adjacent to the fixed contact, with a gram gage and wire tool as shown in Figure 13. Observe the force required to lift the wires when switch contact is broken on the oscilloscope. Lower contact pressure is increased by moving the fixed contact upward.



A) Lower Contact Pressure

B) Upper Contact Pressure

Figure 13
Checking Contact Pressure

To check upper contact (N/C) pressure, insert no-hole tape in the read head, and apply downward force on the wires with the gram gage and wire tool, as shown in Figure 13B. Upper contact pressure is increased by lowering the read head through use of the depth adjusting screw (18, Figure 25) and the lever eccentric.

Timing Adjustment (See Figure 17)

Contact switching should be checked on an oscilloscope by stepping the tape first forward and then in reverse. If the switching in both directions is not within the 4 to 7.5 millisecond zone, loosen the recessed head clamp screw (B, Figure 15) and turn the adjusting screw (A) counter-clockwise to advance the tape; clockwise to delay it.

If the above adjustment proves insufficient to achieve correct timing, insert a short length of alternate hole pattern tape in the reader. Loosen the set screw on the differential spider (5, Figure 8). With the motor running, turn the capstan shaft manually until star wheels sensing "no-hole" are equally spaced between holes. See Figure 14. Retighten the set screw, and readjust as specified above.

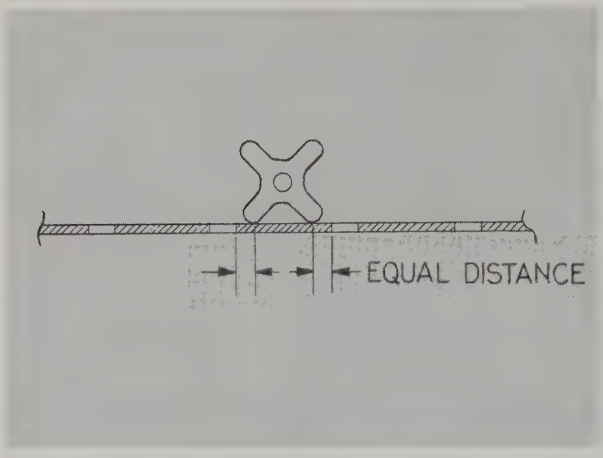


Figure 14
Star Wheel Positioning

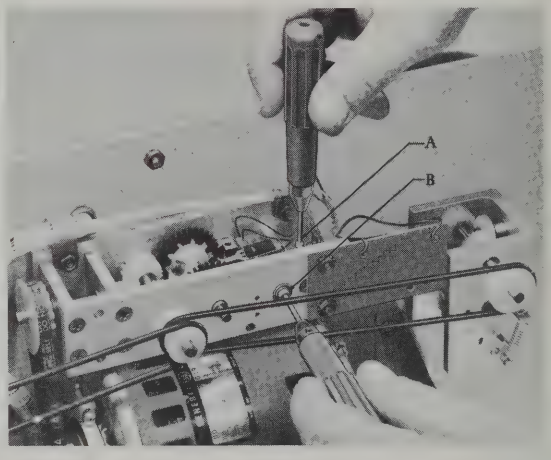


Figure 15
Timing Adjustment

Switching time from upper to lower contacts should be the same as that from lower to upper contacts. Check channel 1 with an oscilloscope. If the times are not equal, adjust the channel 1 side of the fixed contact block until they are. Repeat for channel 8, and recheck channel 1. If switching time is correct on channels 1 and 8, it should be correct for channels 2 through 7. If not, correct the erroneous channels by forming the movable contacts, as shown in Figure 19 and accompanying text. Recheck contact pressure.

Lift Lever

The lift lever should be adjusted so that the lifting stud passes over center with the lever down firmly against the base plate. If adjustment is required, loosen the eccentric bolt and turn the eccentric until the lever locks over center.

CAUTION: Do not move the depth adjusting screw (18, Figure 25). It adjusts upper contact pressure.

Drive System Parts Replacement

To replace damaged gears or shafts, loosen
Noting the position of all shim washers, s

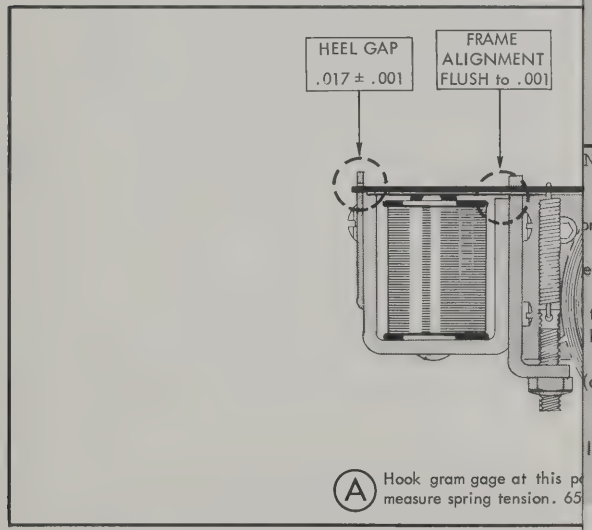
When re-assembling components, re-insert
shim washers, gears or other components c
in their proper places. This will usually
within the tolerances shown in the follow
take away shims when new gears are insta

Component
Motor Input Shaft
Idler/Drive Bevel Gear
Capstan Shaft
Spider Bevel Gear

Escapement Assembly Adjustment

If any parts of the escapement assembly h
assembly to provide the clearances shown

Note: All adjustments to the Model 464
the unit has been operating, wait at least
since operating temperatures elevate suffi



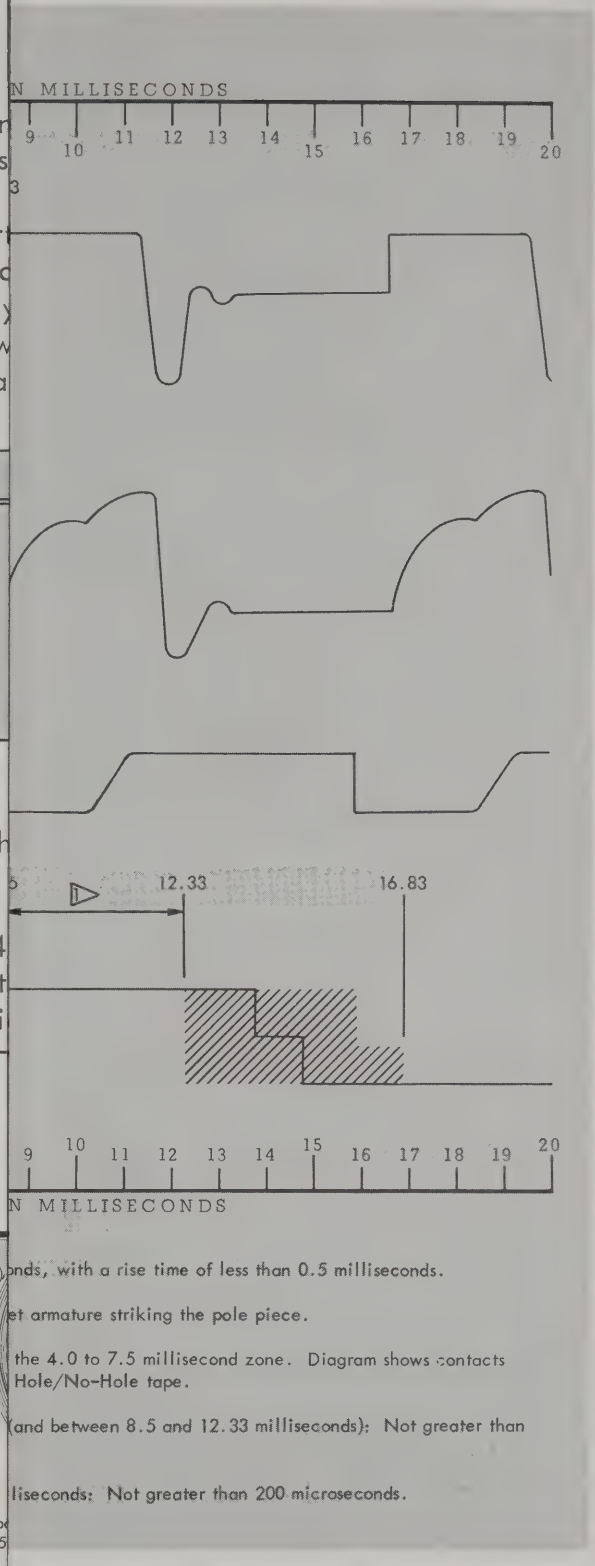

N MILLISECONDS
9 10 11 12 13 14 15 16 17 18 19 20
3
12.33
16.83
9 10 11 12 13 14 15 16 17 18 19 20
N MILLISECONDS
onds, with a rise time of less than 0.5 milliseconds.
et armature striking the pole piece.
the 4.0 to 7.5 millisecond zone. Diagram shows contacts
Hole/No-Hole tape.
(and between 8.5 and 12.33 milliseconds): Not greater than
liseconds: Not greater than 200 microseconds.

Figure 17
Escapement Diagram

Timing Adjustment (See Figure 17)

Contact switching should be checked on an oscilloscope by stepping the tape first forward and then in reverse. If the switching in both directions is not within the 4 to 7.5 millisecond zone, loosen the recessed head clamp screw (B, Figure 15) and turn the adjusting screw (A) counter-clockwise to advance the tape; clockwise to delay it.

If the above adjustment proves insufficient to achieve correct timing, insert a short length of alternate hole pattern tape in the reader. Loosen the set screw on the differential spider (5, Figure 8). With the motor running, turn the capstan shaft manually until star wheels sensing "no-hole" are equally spaced between holes. See Figure 14. Retighten the set screw, and readjust as specified above.

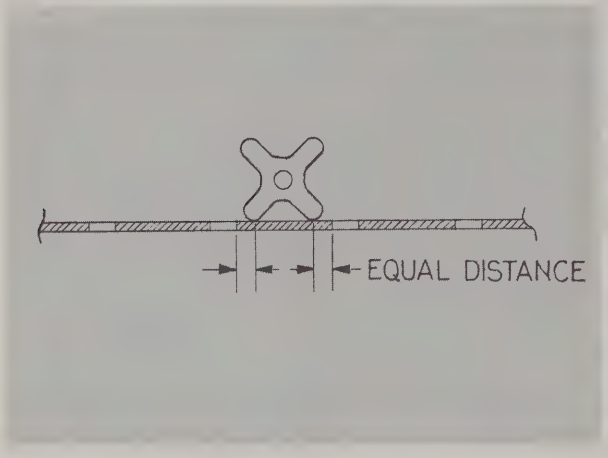


Figure 14
Star Wheel Positioning

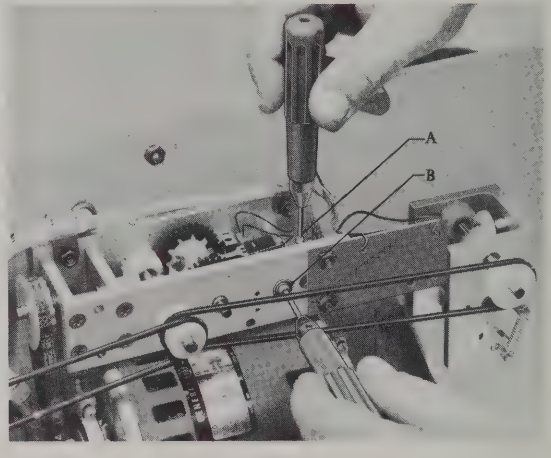


Figure 15
Timing Adjustment

Switching time from upper to lower contacts should be the same as that from lower to upper contacts. Check channel 1 with an oscilloscope. If the times are not equal, adjust the channel 1 side of the fixed contact block until they are. Repeat for channel 8, and recheck channel 1. If switching time is correct on channels 1 and 8, it should be correct for channels 2 through 7. If not, correct the erroneous channels by forming the movable contacts, as shown in Figure 19 and accompanying text. Recheck contact pressure.

Lift Lever

The lift lever should be adjusted so that the lifting stud passes over center with the lever down firmly against the base plate. If adjustment is required, loosen the eccentric bolt and turn the eccentric until the lever locks over center.

CAUTION: Do not move the depth adjusting screw (18, Figure 25). It adjusts upper contact pressure.

Drive System Parts Replacement

To replace damaged gears or shafts, loosen all set screws clamping gears to the shaft. Noting the position of all shim washers, slide the shaft through its bearings.

When re-assembling components, re-insert the shaft through its bearings, picking up shim washers, gears or other components one at a time. Be sure all shim washers are in their proper places. This will usually keep shaft end-play and gear backlash within the tolerances shown in the following table. It may be necessary to add or take away shims when new gears are installed.

Component	End Play	
	Maximum	Minimum
Motor Input Shaft	.015	.005
Idler/Drive Bevel Gear	.010	.001
Capstan Shaft	.010	.005
Spider Bevel Gear	.010	.001

Escapement Assembly Adjustment

If any parts of the escapement assembly have been repaired or replaced, adjust the assembly to provide the clearances shown in Figure 16.

Note: All adjustments to the Model 464 must be made when the unit is "cold." If the unit has been operating, wait at least ten minutes before making any adjustment, since operating temperatures elevate sufficiently to expand tolerances.

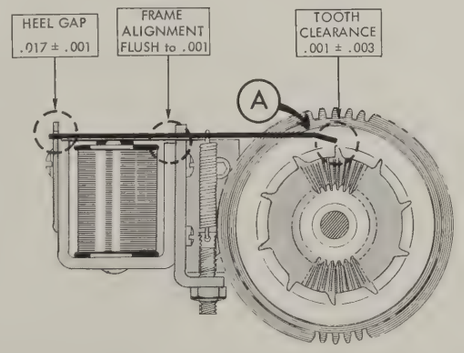

HEEL GAP
.017 ± .001
FRAME ALIGNMENT FLUSH to .001
TOOTH CLEARANCE
.001 ± .003
A
A Hook gram gage at this point and lift armature tip gently to measure spring tension. 65 to 75 grams tension is satisfactory.

Figure 16
Escapement Adjustment

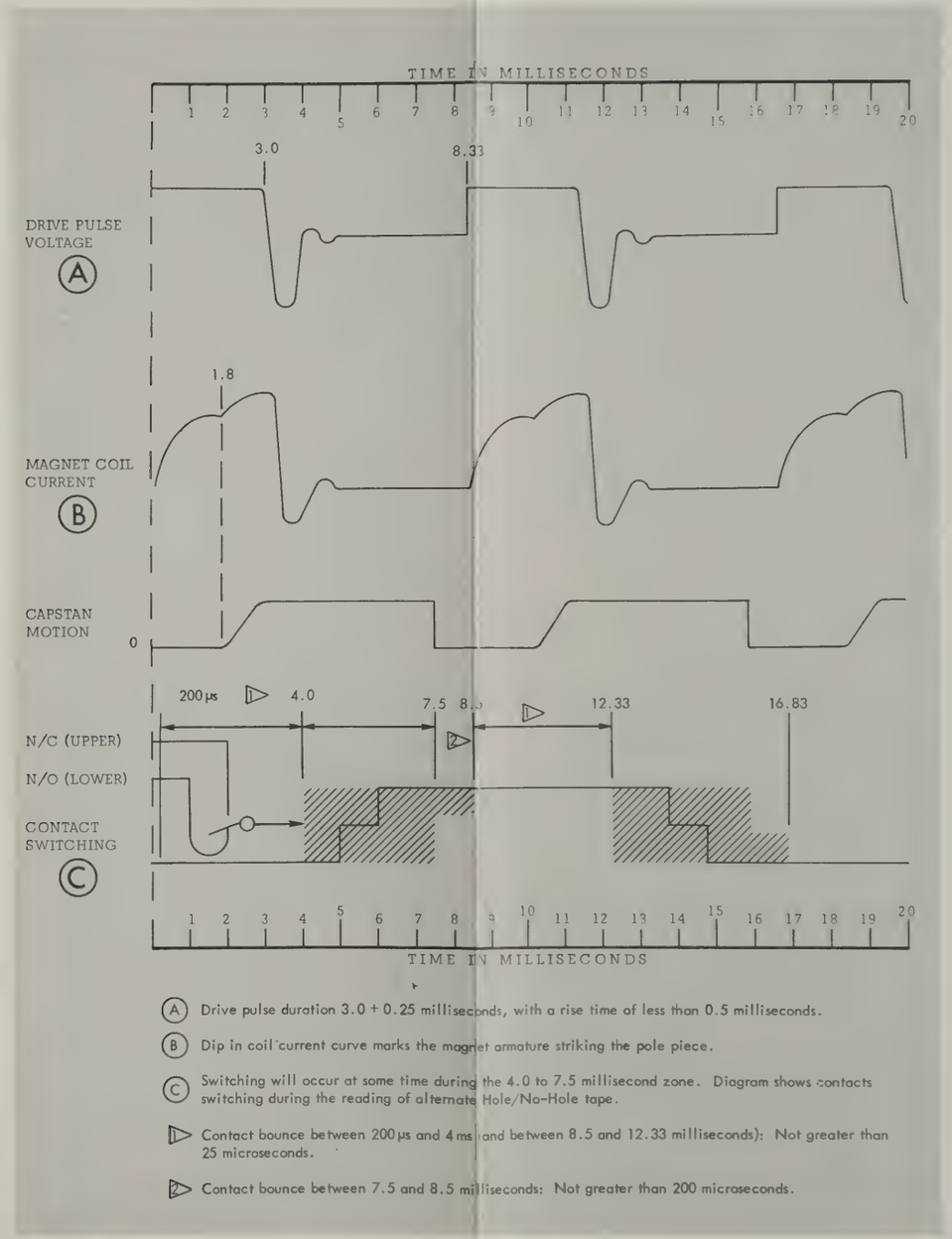

TIME IN MILLISECONDS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
3.0
8.33
DRIVE PULSE VOLTAGE
A
1.8
MAGNET COIL CURRENT
B
CAPSTAN MOTION
0
200 µs
4.0
7.5
8.5
12.33
16.83
N/C (UPPER)
N/O (LOWER)
CONTACT SWITCHING
C
TIME IN MILLISECONDS
A Drive pulse duration 3.0 + 0.25 milliseconds, with a rise time of less than 0.5 milliseconds.
B Dip in coil current curve marks the magnet armature striking the pole piece.
C Switching will occur at some time during the 4.0 to 7.5 millisecond zone. Diagram shows contacts switching during the reading of alternate Hole/No-Hole tape.
Contact bounce between 200 µs and 4 ms (and between 8.5 and 12.33 milliseconds): Not greater than 25 microseconds.
Contact bounce between 7.5 and 8.5 milliseconds: Not greater than 200 microseconds.

Figure 17
Timing Diagram

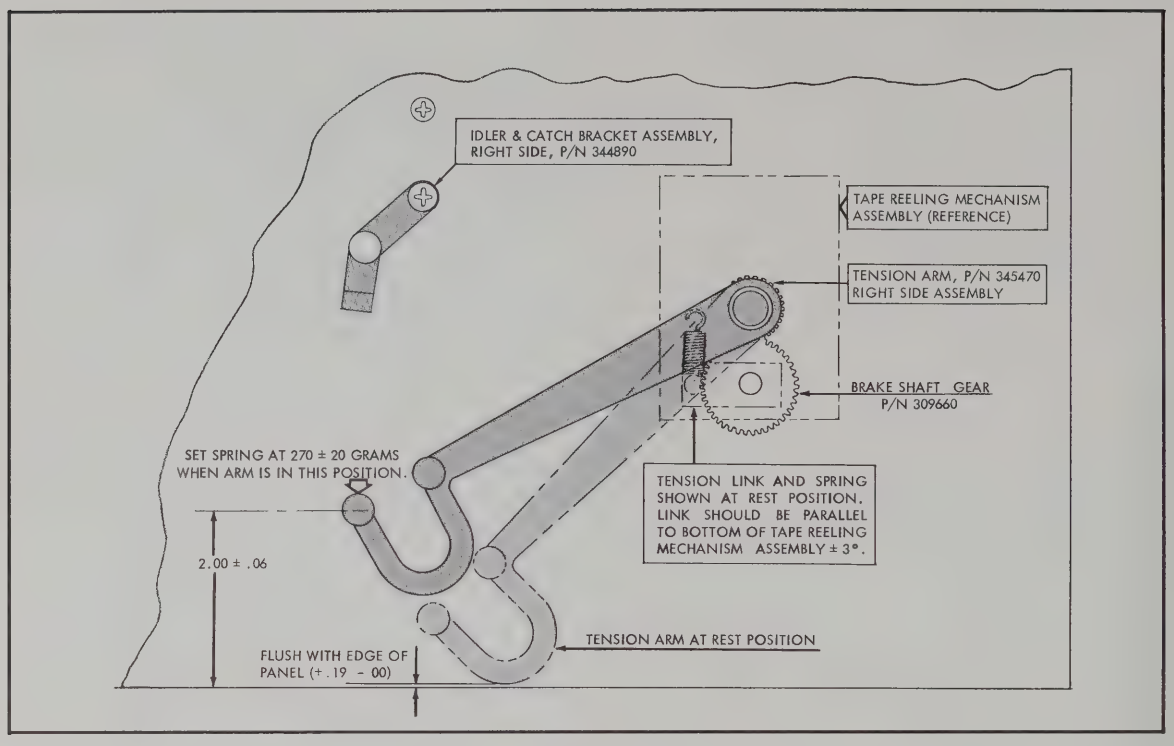

IDLER & CATCH BRACKET ASSEMBLY, RIGHT SIDE, P/N 344890
TAPE REELING MECHANISM ASSEMBLY (REFERENCE)
TENSION ARM, P/N 345470 RIGHT SIDE ASSEMBLY
BRAKE SHAFT GEAR P/N 309660
SET SPRING AT 270 ± 20 GRAMS WHEN ARM IS IN THIS POSITION.
TENSION LINK AND SPRING SHOWN AT REST POSITION. LINK SHOULD BE PARALLEL TO BOTTOM OF TAPE REELING MECHANISM ASSEMBLY ± 3°.
2.00 ± .06
TENSION ARM AT REST POSITION
FLUSH WITH EDGE OF PANEL (+ .19 - 00)

Figure 18
Tension Arm Adjustment

Tension Arm Adjustment

7 1/2 Inch Reeling:

When the tension arm is at "rest" position (brake ON) it must be within + .19 to - .00 inches from the bottom of the panel, as shown in Figure 18.

Move the tension arm upward and set the spring tension in the reeling mechanism to provide a pull of 270 ± 20 grams when the center line of the farthest roller (from the arm pivot) is 2 ± .06 inches from the bottom of the panel. Position the tension link parallel to the bottom of the reeling mechanism frame when the adjustment is achieved. Tighten all set screws.

Six Inch Reeling:

When the tension arm is at "rest" position (brake ON), it must be within 1 1/8 inches above the bottom edge of the panel.

The tension spring, when extended, must exert 110 ± 10 grams pressure at the end of the arm on the lower roller. Position the tension link parallel with the bottom of the reeling mechanism frame when the adjustment is achieved, and tighten all set screws.

PREVENTIVE MAINTENANCE

Daily Maintenance

Daily maintenance is necessary only with readers handling 10,000 feet or more of paper tape per day. Clean the read head area with a soft brush or light air blasts. Clean out lint from the star wheels. Observe the general operation of the reader. If problems develop, call in a serviceman. An early call could prevent costly down time.

40-Hour Maintenance

Readers handling less than 10,000 feet of tape per day require maintenance at 40 operating hour intervals, rather than daily. Follow the procedure outlined in Daily Maintenance, above.

250-Hour Maintenance

CAUTION: The following maintenance requires special tools and some familiarity with the unit.

After every 250 hours of stepper operation, perform first the Daily Maintenance and then the following procedure:

Static Inspection

Read Head

1) Condition of contacts -- check for burning, dirt and oil contamination. Clean contaminated contacts with methyl ethyl ketone, or some other non-corrosive solvent that leaves no residue.
2) Wire alignment -- wires parallel and not rubbing against the insulator comb.
3) Stripper alignment -- fingers in grooves.
4) Star wheels aligned within grooves.
5) Star wheels secure but free, with no lint in levers. Note: This is a particularly important point, as a common cause of read errors in star wheel (or star wheel levers) jammed by lint.

Capstan Drive Mechanism

1) Visually inspect the mechanism for worn or damaged parts. Check for excessive shaft end play, and for lug belt wear and alignment.
2) Replace anti-residual shims, and check escapement actuators for:

a) armature tip wear
b) relay frame wear on surfaces where the armature strikes the frame -- Replace the frame when wear exceeds .008 inch.
c) clutch tooth wear -- Check for broken, rounded or pitted teeth at point of armature contact.
d) cleanliness.
e) clearances -- See Figure 16.

Reeling Mechanism

1) Visually inspect the mechanism for worn or damaged parts. Check for belt wear and alignment.

2) Check for binding of Tape Control Arms.

Lubrication

Lubricate the unit according to ROUTINE MAINTENANCE, page 9.

Dynamic Inspection

Read Head

1) Observe tape motion for erratic behavior.

2) Check switch timing, page 7.

Capstan Drive Mechanism

1) Observe tip to clutch tooth operation in the mechanism. Erratic behavior indicates worn or damaged clutch teeth, worn armature or improper clearances.

2) Observe drive pulses on an oscilloscope. Check for specified amplitude and duration.

Reeling Mechanism

1) Observe for smooth operation.

2) Ascertain that belts are not slipping.

General Inspection

Inspect the cleanliness and overall operation of the reader.

500-Hour Maintenance

After 500 hours of motor operation, perform the 250-Hour Maintenance.

750-Hour Maintenance

After 750 hours of motor operation, perform the 250-Hour Maintenance. Inspect the unit for overall wear. Factory overhaul may be advisable at this time. In any event, factory overhaul will probably be necessary after 1,000 hours of operation.

TROUBLE SHOOTING

The following discussion is divided into three major areas: Stepping Errors, Reading Errors, and Reeling Failure. The first step in trouble-shooting the unit is to examine it in operation, to localize the problem. Stop the unit, and examine the sub-assembly in question for worn or damaged parts.

Stepping Errors—Capstan Drive Mechanism

A) Improper drive pulse. Inspect with scope and adjust if necessary. See Input Requirements, page 1 and Timing Diagram, page 13.

B) Suppression defective on wrong type. See Suppression, page 8.

C) If neither of the above is responsible, remove the armature from each escapement assembly; inspect and thoroughly clean the assembly. Ascertain that the capstan drive mechanism conforms to the following specifications. Refer to Figure 16.

1)	Bracket -- frame alignment	Flush to .001 inch
2)	Heel Gap (with shim)	.017 ± .001 inch
3)	Tooth Clearance	.010 ± .003 inch
4)	Armature Return Spring Force (measured on the armature at the tip. See Figure 16)	60 to 75 grams
5)	Lubricant on armature's felt pad.	
6)	Capstan shaft end play	.005 - .010 inch
7)	Differential spider gear end play	.001 - .010 inch
8)	Differential spider screw tightness	17 - 21 in-lbs.
9)	Capstan set screw tightness (where applicable).	
10)	Armature tip engagement on tooth (dynamic).	
11)	Tape pull -- 300 gram minimum. Insert a short length of alternate hole pattern tape in the reader. Hook a gram gage to the end of the tape. Pull on the gage until it reads about 400 grams. Press on the armature to release the escapement and observe the reading while allowing the tape to slip through the read head. Check both forward and reverse friction clutches.	
12)	Check drive pulse voltage and magnet coil current when possible. (Traces A and B, Figure 17).	

Reading Errors—Read Head

A) Incorrect hole spacing on tape being read. Sprocket and/or bit holes in tape badly worn, causing poor location of tape with respect to star wheels. Inspect tape. An accumulation of lint and dust is a major cause of reading errors. Star wheels may sometimes be jammed or sufficiently clogged with lint or dust as to prevent normal operation. A thorough cleaning at regular intervals will keep lint and dust build-up to a minimum.

B) Ascertain that the read head's condition is in accordance with the following specifications:

1) Condition of contacts -- check for burning or dirt.
2) Stationary contact gap -- .025 - .030 inch.
3) Wire alignment -- straight and parallel.
4) Stripper alignment -- fingers in grooves.
5) Star wheels centered in grooves.
6) Star wheels secure but rotating freely.
7) Read head holds open with lift lever up.
8) Tape hold down adjustment -- See Lift Lever, page 12.
9) Contact pressure -- 10 to 20 grams -- See page 11.
10) Switching zone -- 4 to 7.5 milliseconds. See Timing Adjustment, page 12.

C) If the contacts need replacement or adjustment, refer to the following procedure:

1) Set the movable contact assembly at .069 inch from the star wheel bracket. See Figure 19A.
2) Align the wires straight and parallel with the tweaking tool. Check alignment against the fixed contacts, holding the fixed contact block in line with its mounting holes. See Figure 19B.
3) Bend the wires so the distance from the arm base plate to the underside of the wire is 16/32 to 17/32 inch. See Figure 19A.
4) Check step #2.
5) Set the read head on a flat surface in position shown in Figure 19A. With a square or some other edge perpendicular to the flat surface, apply pressure toward the arm base plate at the point where the star wheel carriers make contact. See that the wires move together. See Figure 19D.

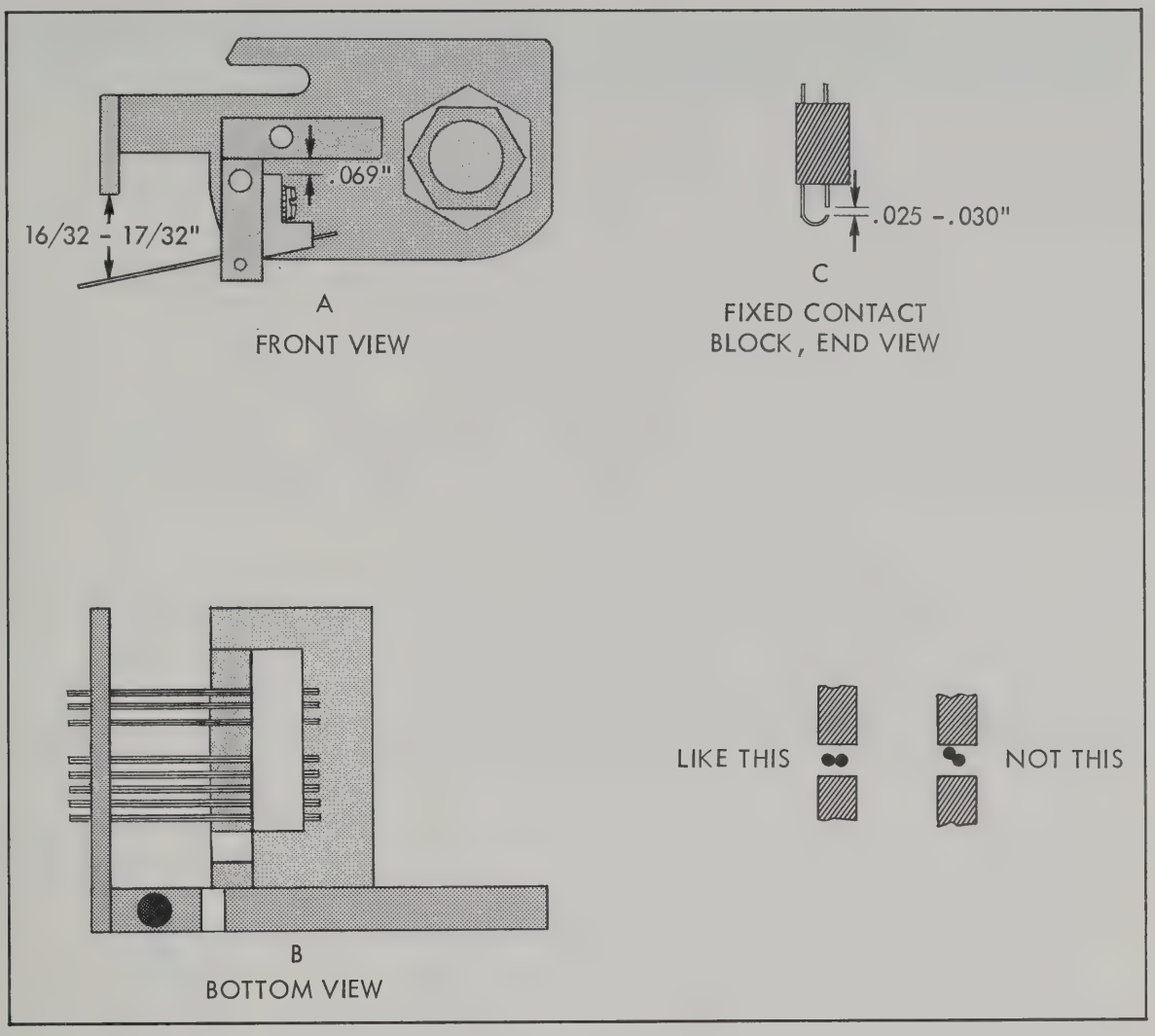


Figure 19
Read Head Contact Measurements

Reeling Failure

A) Visually examine the reeling mechanism while it is in operation.

B) Ascertain that the tape control arm is adjusted to + .19 - .00 inch above the bottom edge of the panel, in an "at rest" position.

C) Ascertain that the tension spring, when extended, exerts 270 ± 20 grams pressure at the end of the arm on the lower roller.

D) Ascertain that the tape control arm moves freely without binding.

END-OF-TAPE SENSOR

The End-of-Tape Sensor is designed to provide a contact transfer to indicate the end of tape, regardless of its direction of movement. Either the "make" or "break" signal may be used, depending upon the logic requirements of the system.

Operation

A lever-actuated form "C" sensing switch is mounted on the inside face of the read head stripper plate. The roller on the end of the switch actuator protrudes through a slot in both the stripper plate and the tape pressure guide. When tape is under the tape guide, the switch contacts are transferred to the normally open position, due to tape pressure against the switch actuator.

When no tape is present, the switch contact is in the normally closed position as seen in Figure 20. The sensing switch is positioned at the side of the capstan.

Alternate logic for the End-of-Tape Sensor may be easily arranged by removing the stripper plate, disconnecting the wires from the N/C switch terminals, and reconnecting them to the N/O terminals.

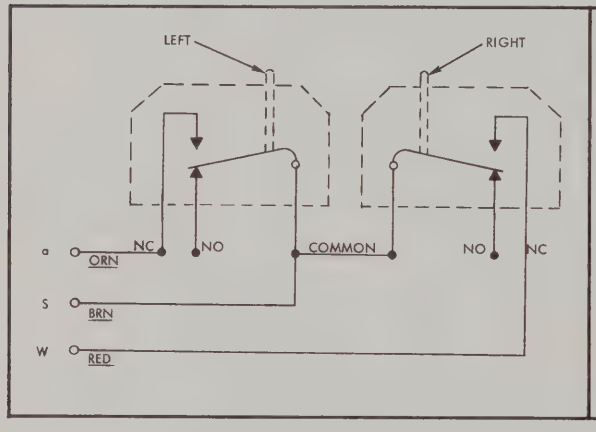


Figure 20
EOT Wiring

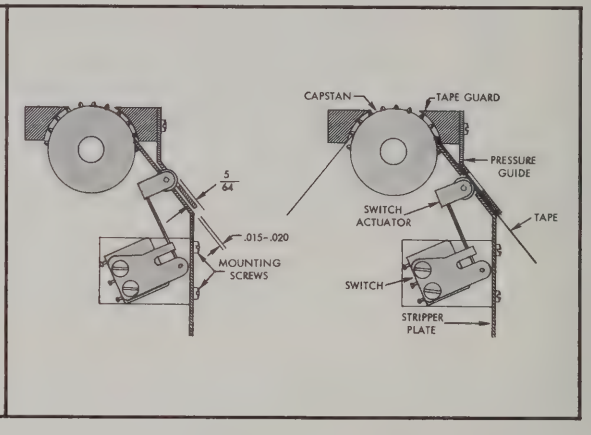


Figure 21
EOT Adjustment

Adjustment (See Figure 21)

The roller on the switch actuator should protrude through the stripper plate 5/64 inch, so that the switch will be closed when tape is moving under the tape pressure guide. This adjustment is made by loosening the two mounting screws on the outside face of the stripper plate and moving the block assembly up or down. The tape pressure guide should be adjusted so that there is .015 to .020" clearance between the stripper plate and guide.

PARTS ORDERING PROCEDURE

To order a replacement part, find the part required and order by the part number and name. Include the model and serial number of the unit on which it is to be used.

Spare parts should be ordered from Tally Corporation, 1310 Mercer Street, Seattle, Washington 98109. A major inventory of replacement parts is maintained at the factory for prompt service.

Any order for production parts will be recognized as a normal order -- unless otherwise stated. Parts are shipped within three or four working days from receipt of order.

Tally will ship parts within 24 hours to fill any order marked "EMERGENCY--RUSH."

Contact your local sales or service representative for assistance in matters concerning prices or unlisted parts.

Note: Minimum Order $5.00

FIELD SERVICE TOOL KIT

Part Number	Description
318150	Kit, Lubrication
152391	Gage Adapter, Upper Contact
152392	Gage Adapter, Lower Contact
226620	Arm, Torque
228860	Gage, Tip Clearance, .007/.013
229470	Gage, Heel Gap, .021/.023
312620	Tape Tester (Pull Test)
312630	Tape Tester (Hole-no-hole)
314590	Hook, Pull
314610	Gram Gage, 3-30 Grams maximum
314620	Gram Gage, 500 Grams maximum
314650	Wrench, #2, 90° Snap-ring
314670	Driver, Allen Set
314680	Driver, Allen, 7/64
314690	Driver, Allen, 9/64
4043301	Wrench, 5/16" Open End (Williams)

RECOMMENDED SPARE PARTS

The following list includes those items on which wear is most likely to occur. These parts should be kept on hand to provide on-the-spot repair of simple breakdowns. The quantities suggested below are based on the minimum replacement requirements of one to five instruments.

Quantity	Part Number	Description
2	220532	Coil, 48V, 220Ω
2	220535	Coil, 24V, 50Ω
4	224430	Clutch, Friction
5	225372	Washer, Shim (.005" x 3/16" I.D.)
5	225373	Washer, Shim (.010" x 3/16" I.D.)
5	225375	Washer, Shim (.005" x 1/4" I.D.)
5	225376	Washer, Shim (.010" x 1/4" I.D.)
10	226374	Shim, Flat, Anti-residual, .004"
2	300372	Spring, Escapement (CDM)
10	304282	Washer, Wave (Spider)
2	305081	Lug Belt, Motor Drive (464 Panel/Reeling) OR
2	305082	Lug Belt, Motor Drive (464 Console)
2	305091	Belt, O-Ring Drive, R.H.
2	305092	Belt, O-Ring Drive, L.H.
5	305232	Grip Ring, Truarc #5103-18
8	312390	Lever/Star Wheel Assembly
2	318460	Armature, Escapement (CDM)
5	4100800	Fuse, Slo-Blo, 1.6A (MDL) 230V OR
5	4100900	Fuse, Slo-Blo, 2A (MDL) 115V
5	4177100	Washer, Wavy

PARTS LIST

General Assembly

Index	Part Number		Description
1	4159700		Screw, #6-32 x 5/16", Pan Head, Slotted
2	4070400		Relay, Motor Start, RBM #9125-132
3	4158520		Screw, #6-32 x 3/16", Round Head, Slotted
4	302990		Motor, 1/12 HP, 115/230V, 60/50 cps
5	2204434		Pulley, 14-Tooth, w/#4154400 Set Screw, #4-40 x 3/16"
6	305081		Lug Belt, Motor Drive
7	305091		Belt, O-Ring Drive, R.H.
8	228560		Pulley, Driven, w/#4159000 Set Screw, #6-32 x 1/4"
9	345440		Reel Drive Mechanism, R.H.
10	519653		Panel, No Accessories, OR
10	305397		Panel, Six-Inch Reeling
11	345470	1	Tape Control Assembly, R.H. AND
12	229490		Adapter, Reel AND
13	519950		Reel, Take-up, 7 1/2"
14	226220		Block, Outboard Bearing Assembly OR
14	226330		Block, Outboard Bearing Assembly, w/EOT
15	4164900		Screw, #8-32 x 7/16", Socket Head Cap
16	216801		Capstan
17	4107300		Roll Pin, 1/16" O.D. x 1/2"
18	513432		Read Head Assembly
19	309660		Gear, Brake Shaft
20	141620		Plate, Rubbing
21	4166100		Screw, #8-32 x 3/4", Flat Head Phillips
22	344890		Bracket, Idler and Catch Assembly, R.H.
23	344910		Bracket, Idler and Catch Assembly, L.H.
24	345471	1	Tape Control Assembly, L.H.
25	4165500		Screw, #8-32 x 1/2", Flat Head Phillips
26	4169350		Screw, #1/4-20 x 5/8", Flat Head Phillips
27	4179000		Lock Washer, Split, #1/4
28	4172300		Hex Nut, Kep, #6-32
29	4172300		Hex Nut, Kep, #6-32
30	519640		Chassis, Motor
31	345450		Reel Drive Mechanism, L.H.
32	315575		Capstan Drive Mechanism, 48V, OR
32	315577		Capstan Drive Mechanism, 24V
33	4097910		Clamp, Cable, 1/4" I.D.
34	4173260		Hex Nut, Kep, #8-32
35	4176050		Washer, Flat, 1/4"

General Assembly

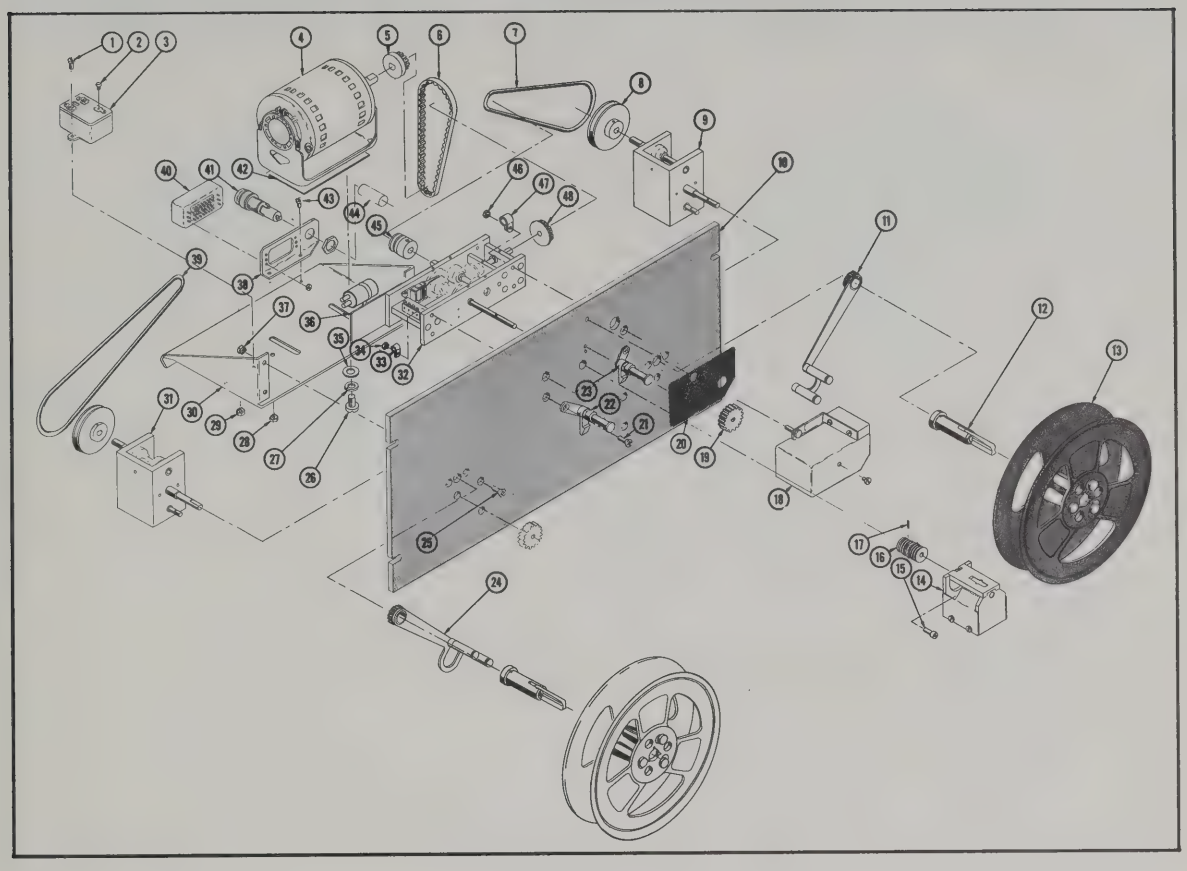


Figure 22
Exploded View

Index	Part Number	Description
36	313671	Network Assembly, 48V OR
36	313670	Network Assembly, 24V
37	4173260	Hex Nut, Kep, #8-32
38	225360	Bracket, Connector and Fuse
39	305092	Belt, O-Ring Drive, L.H.
40	147691	Connector, Plug (Note next item) AND
	147692	Connector, Socket (Not Shown)
41	4089270	Holder, Fuse
42	305810	Spacer, Motor (As Required)
43	4159700	Screw, #6-32 x 5/16", Pan Head Slotted
44	4103400	Sleeving
45	312060	Pulley, Reel Drive
46	4173260	Hex Nut, Kep, #8-32
47	4098300	Clamp, Cable, 1/2" I.D.
48	220441	Pulley CDM, 12-Tooth, 60 cps w/#4153900 Screw
48	220445	Pulley CDM, 12-Tooth, 50 cps w/#4153900 Screw

▷ For Six-Inch Reeling, see page 35

PARTS LIST

464 Console

Index	Part Number	Description
1	4089270	Holder, Fuse
2	4155100	Screw, #4-40 x 1/4", Pan Head, Slotted
3	318580	Cover, Rear
4	302990	Motor, 115V/230V, 60/50 cps
5	305130	Fan, Cooling, 4 Blade
6	2204433	Pulley, Motor, 12-Tooth, 60 cps OR
6	2204434	Pulley, Motor, 14-Tooth, 50 cps
7	305082	Lug Belt, Motor Drive
8	4173250	Hex Nut, Kep, #8-32
9	315575	Capstan Drive Mechanism, 48V OR
9	315577	Capstan Drive Mechanism, 24V
10	220445	Pulley, Capstan Drive Mechanism, 10-Tooth
11	4173420	Hex Nut, Kep, #8-32
12	312660	Cover
13	218430	Plate, Front
14	4165700	Screw, #8-32 x 5/8", Flat Head, Phillips
15	4159100	Screw, #6-32 x 1/4", Pan Head Slotted
16	141620	Plate, Rubbing
17	226160	Lever, Lift AND
17	138890	Handle, Lift Lever
18	320020	Read Head Assembly
19	513580	Cover, Read Head
20	137550	Bushing, Pivot Adjust
21	137560	Bushing, Pivot Clamp
22	4159100	Screw, #6-32 x 1/4", Pan Head, Slotted
23	226220	Outboard Bearing Block Assembly OR
23	226330	Outboard Bearing Block Assembly, w/EOT
24	4165100	Screw, #8-32 x 1/2", Socket Head, Cap
25	216801	Capstan Assembly
26	225130	Eccentric, Lift Lever Adjusting
27	4165100	Screw, #8-32 x 1/2", Socket Head, Cap
28	4177100	Spring, Preload (R-2)
29	137540	Block, Latch
30	4161200	Screw, #6-32 x 1/2", Flat Head, Phillips
31	4169200	Screw, #1/4 x 20, Pan Head, Slotted
32	4179000	Lock Washer, Split, #1/4
33	4176050	Washer, Flat, #1/4

464 Console

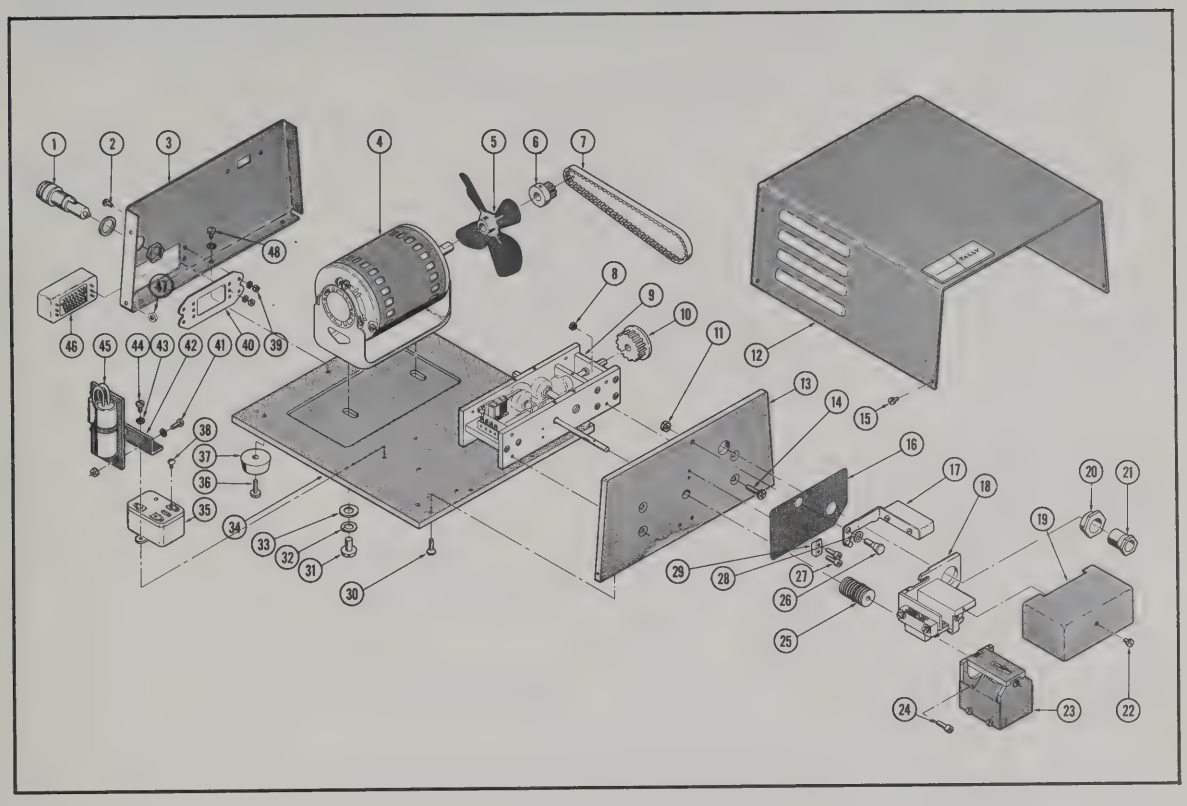


Figure 23
Exploded View

Index	Part Number	Description
34	514100	Plate, Base
35	4070400	Relay, Motor Start, RBM #91252-132
36	4164800	Screw, #8-32 x 3/8", Pan Head, Slotted
37	4093900	Foot, Rubber (General Cement #1075FM)
38	4158520	Screw, #6-32 x 3/16", Round Head, Slotted
39	4172100	Hex Nut, Kep, #4-40
40	305140	Plate, Mounting
41	4159700	Screw, #6-32 x 5/16", Pan Head, Slotted
42	310450	Bracket, Card
43	4178970	Washer, #6 Internal Star
44	4159700	Screw, #6-32 x 5/16", Pan Head, Slotted
45	313671	Network Assembly, 48V OR
45	313670	Network Assembly, 24V
46	147691	Connector, Plug AND
46	417692	Connector, Socket
47	4172600	P-Nut, #6-32
48	4159700	Screw, #6-32 x 5/16", Pan Head, Slotted

PARTS LIST

Capstan Drive Mechanism

Index	Part Number	Description
1	219960	Plate, Front Bearing
2	304211	Bushing, w/Flange
3	315565	Escapement Assembly, 48V OR
3	315567	Escapement Assembly, 24V
4	304213	Bushing, w/Flange
5	135511	Shaft, Idler, w/Bevel Gear
6	4155050	Screw, #4-40 x 1/4", Socket Head, Cap
7	135560	Gear, Spider Bevel
8	304282	Washer, Wave
9	4095600	Grip Ring, C, Truarc #5103-18MD
10	4155100	Screw, #4-40 x 1/4", Pan Head, Slotted
11	145560	Strip, Terminal
12	220650	Spacer, Bearing Block, Horizontal
13	315565	Escapement Assembly, 48V OR
13	315567	Escapement Assembly, 24V
13a	318460	Armature, w/Oil Reservoir, Assembly
13b	300372	Spring, Actuator
13c	304370	Screw, Spring Tension Adjust
13d	313740	Bracket, Latch Actuator
13e	4157500	Screw, #4-48 x 1/8", Pan Head, Slotted
13f	4172400	Nut, Elastic Stop, #6-32, Type NTM
13g	226374	Shim, Anti-Residual, .004"
13h	220535	Coil, Electromagnet, 48V, 50Ω OR
13h	220537	Coil, Electromagnet, 24V, 8Ω
13i	4157500	Screw, #4-48 x 1/8", Pan Head, Slotted
13j	4176150	Washer, #4, Flat
13k	223770	Limit, Escapement
13l	223761	Coil Frame Assembly
14	4160600	Screw, #6-32 x 1/2", Socket Head Set, Nylock
15	145780	Plate, Capstan Adjusting
16	229030	Bushing, w/Flange
17	219970	Plate, Rear Bearing
18	4165500	Screw, #8-32 x 1/2", Flat Head, Phillips
19	304182	Screw, #6-32 x 1/2", Socket Head, Cap
20	4179400	Washer, #6 Internal Star
21	4175300	Washer, #6 Flat
22	304204	Bushing, w/Flange
23	320221	Washer, Thrust

Capstan Drive Mechanism

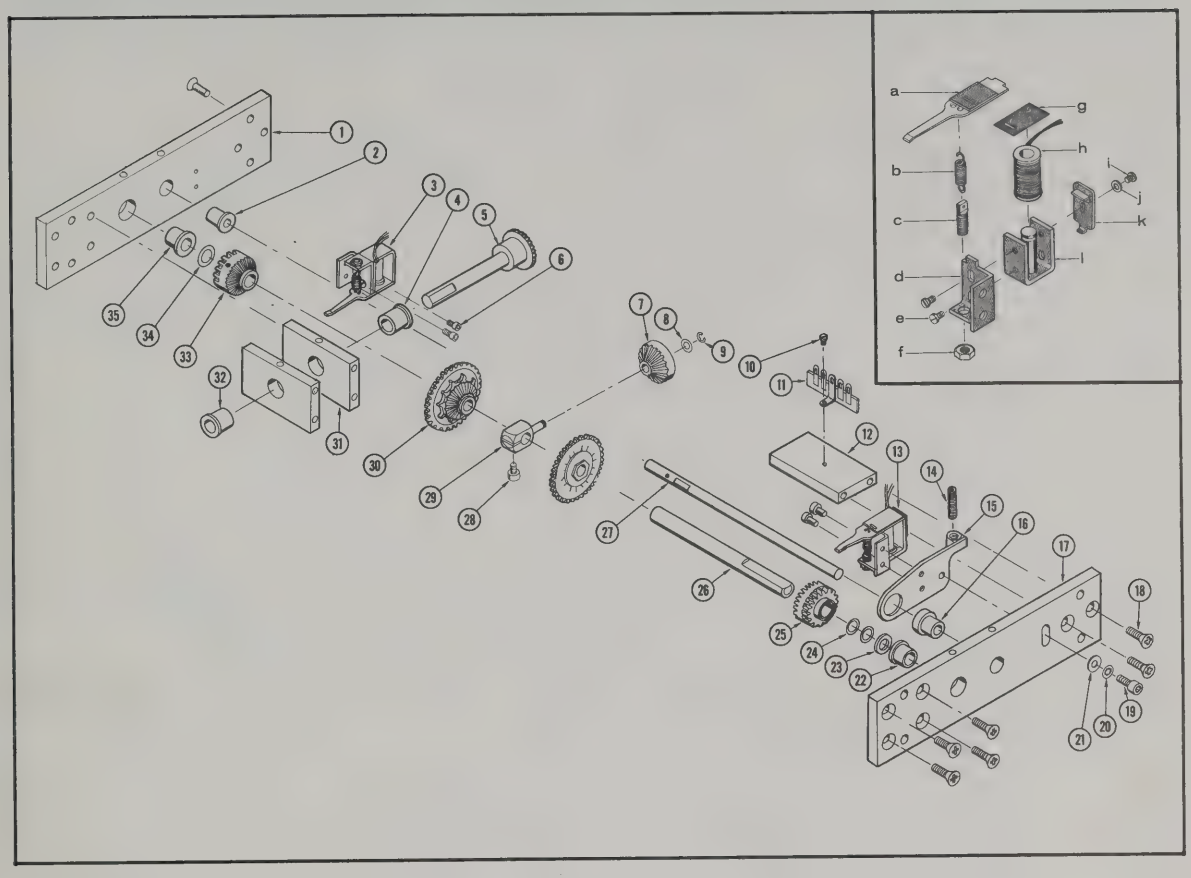


Figure 24
Exploded View

Index	Part Number	Description
24	225370	Shim (As Required)
25	135540	Gear, Bevel
26	147640	Shaft, Drive
27	135530	Shaft, Capstan
28	304181	Screw, #6-32 x 3/8", Socket Head, Cap
29	135550	Spider, Differential
30	224430	Friction Clutch Assembly
31	220640	Spacer, Vertical
32	304213	Bushing, w/Flange
33	138240	Gear, Bevel, w/Set Screw
34	225370	Shim (As Required)
35	304212	Bushing, w/Flange
	315575	Capstan Drive Mechanism, 48V, Complete Assembly OR
	315577	Capstan Drive Mechanism, 24V, Complete Assembly

PARTS LIST

Read Head Assembly

Index	Part Number	Description
1	4173400	Hex Nut, Kep, #10-32
2	226160	Lever, Lift
3	138890	Handle, Lift Lever
4	218110	Plate, Arm and Base
5	4107001	Pin, Dowel, 1/16 x 5/16"
6	2253710	Washer, Shim .755" I.D. x .002"
7	137550	Bushing, Pivot Adjust
8	304710	Cover, Read Head OR
8	513581	▷2◁ Cover, Read Head
9	137560	Bushing, Pivot Clamp
10	216850	Bracket, Star Wheel
11	216870	Assembly, Movable Contact
12	4179400	Washer, #6 Internal Star
13	4160200	Screw, #6-32 x 3/8", Pan Head
14	4159100	Screw, #6-32 x 1/4", Pan Head
15	4177100	Spring, Pre-load R-2
16	225130	Eccentric, Lift Lever Adjusting
17	225375	Washer, Shim (As Required)
18	4168300	Screw, #10-32 x 3/8", Set Socket Head
19	4160000	Screw, #6-32 x 3/8", Allen Cap
20	137520	Insulator, Read Head
21	4161700	Screw, #6-32 x 5/8", Pan Head
22	4179400	Washer, #6 x 3/8" O.D., Plain Flat
23	4179880	Washer, #6 x 5/16 O.D., External Star
24	216860	Contact Assembly, Fixed
25	137540	Block, Latch
26	4165100	Screw, #8-32 x 1/2", Allen Cap
27	135370	▷1◁ Lever, Star Wheel
28	226570	▷1◁ Star Wheel
29	226120	Retainer, Pivot Pin
30	137350	Spacer, Star Wheel Lever
31	136630	Pin, Lever Pivot
32	4155100	Screw, #4-40 x 1/4", Pan Head
33	4159100	Screw, #6-32 x 1/4"
	513432	Read Head Assembly, 464 7 1/2-Inch Reeling OR
	513431	Read Head Assembly, 464 Console or 464 Six-Inch Reeling

▷1◁ 312390 Star Wheel Lever and Star Wheel Assembly
▷2◁ This cover is used on #513431 Read Head Assembly

Read Head Assembly

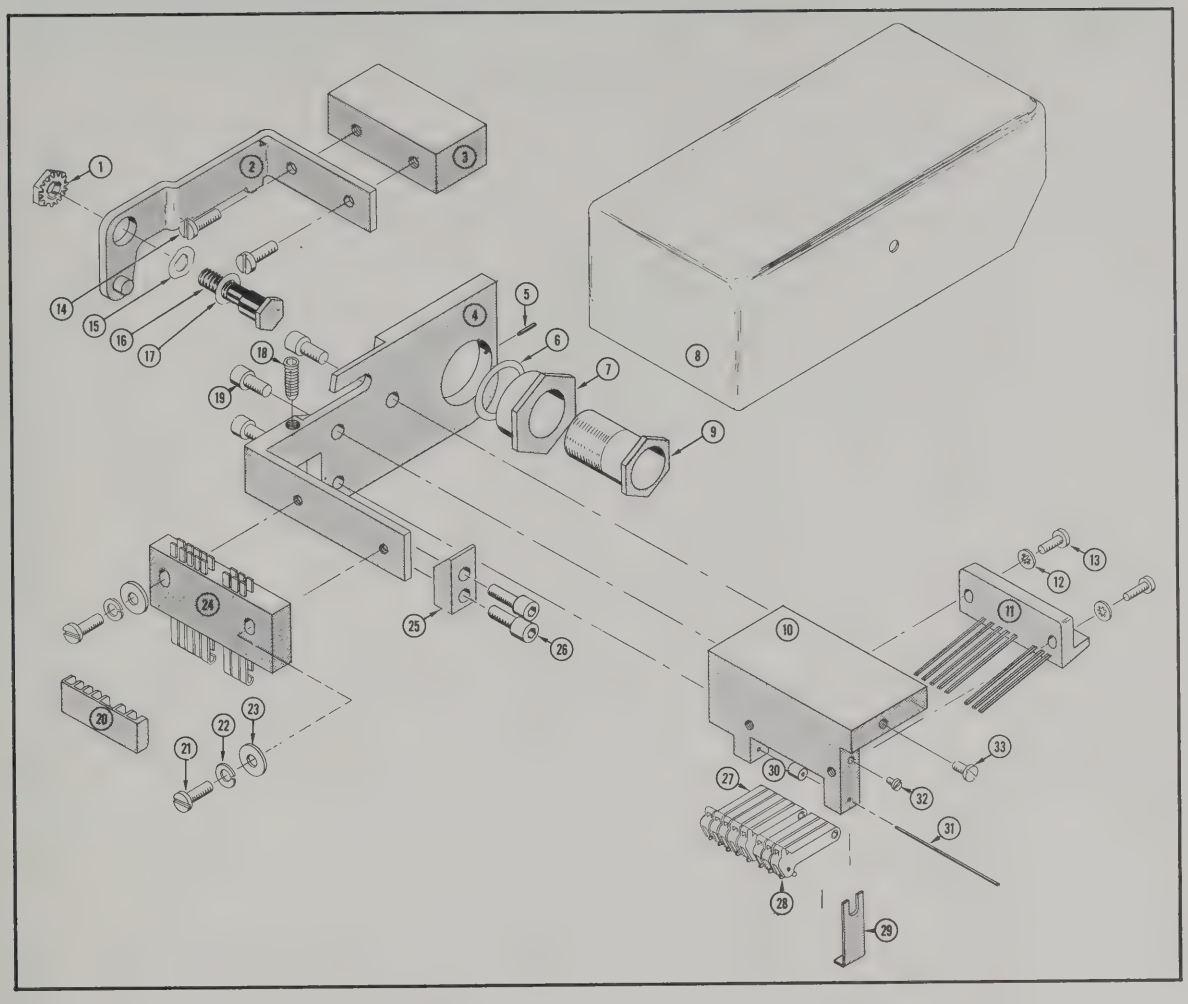


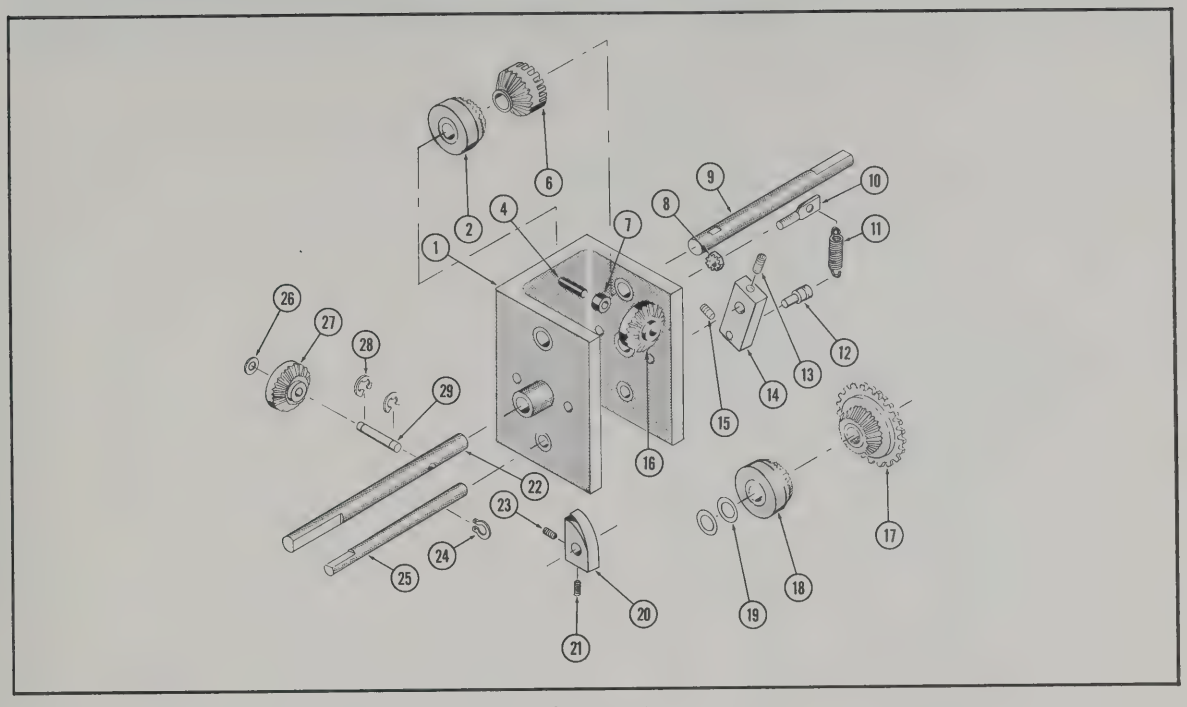
Figure 25
Exploded View

PARTS LIST

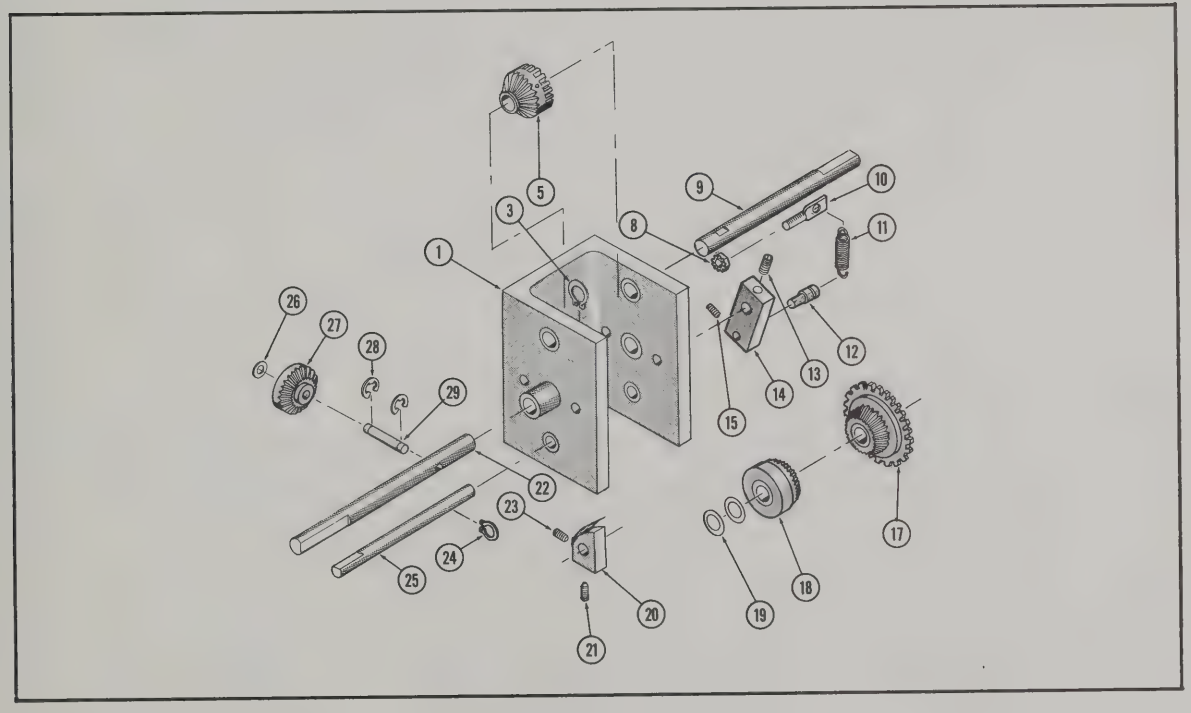
Reel Drive Mechanism

Index	Part Number	Description
1	328830	Frame, Reel Drive Mechanism
2	146440	Gear, Bevel
3	4096800	Grip Ring, C, Truarc #5555-25MD
4	4106800	Pin, Dowel, 3/16" O.D. x 7/8" Length
5	138240	Bevel Gear Cluster w/Set Screw
6	135540	Bevel Gear Assembly
7	146630	Spacer
8	4173250	Hex Nut, Kep, #8-32
9	144850	Shaft, Drive
10	4170700	Bolt, Spade, #8-32 x 3/8"
11	345430	Spring, Brake
12	146701	Post, Spring
13	4163300	Screw, #8-32 x 1/4", Socket Head Set, Cup Point
14	312040	Link, Tension
15	4163900	Screw, #8-32 x 1/4", Socket Head Set, Cone Point
16	226520	Gear, Spider Bevel
17	228870	Gear, Combination Bevel/Spur
18	228910	Gear, Brake Drum
19	225376	Shim, .010 (As Required)
20	144930	Brake, Assembly
21	4163300	Screw, #8-32 x 1/4", Socket Head Set, Cup Point
22	228892	Shaft, Reeling
23	4163900	Screw, #8-32 x 1/4", Socket Head Set, Cone Point
24	4096700	Grip Ring, C, Truarc #5555-18MD
25	144840	Shaft, Tension
26	4175250	Washer, Plain
27	226520	Gear, Spider Bevel
28	4096400	Grip Ring, C, Truarc #5144-12MD
29	228880	Pin, Differential Spider
	345440	Reel Drive Mechanism, R.H., Complete Assembly
	345450	Reel Drive Mechanism, L.H., Complete Assembly

Reel Drive Mechanism



Left Hand



Right Hand

Figure 26
Exploded Views

PARTS LIST

Sensing Arm Assembly

6 INCH REELING (Not Shown)

303134	▷	Sensing Arm Assembly, 6" Reeling

CONSISTING OF:

218644	Sensing Arm, 6" Reeling, R.H.
218645	Sensing Arm, 6" Reeling, L.H.
141280	Roller, Sensing Arm
319921	Grip Ring, Truarc #5555-12
335670	Collar, Set
220301	Reel Assembly, 6" Tape Take-up
221411	Rear Flange and Hub Assembly
228591	Front Flange and Retainer Assembly
145290	Spring
145270	Stud
4163600	Screw, #8-32 x 1/4" Button Head, Socket

▷ Specify either Right or Left hand side when ordering.

Tape Tension Arm Assembly

7-1/2 INCH REELING (See Figure 27)

Index	Part Number	Description
	344890	Tape Idler and Tension Arm Catch Assembly, R.H. AND
	344910	Tape Idler and Tension Arm Catch Assembly, L.H.
		CONSISTING OF:
1	346230	Shaft, Idler Roller
2	345530	Roller, Idler
3	4172110	Hex Nut, Kep, #5-40
4	346220	Catch, Tension Arm
5	346240	Bracket, Idler and Catch
6	4165700	Screw, #8-32 x 5/8", Flat Head, Phillips

Tape Tension Arm Assembly

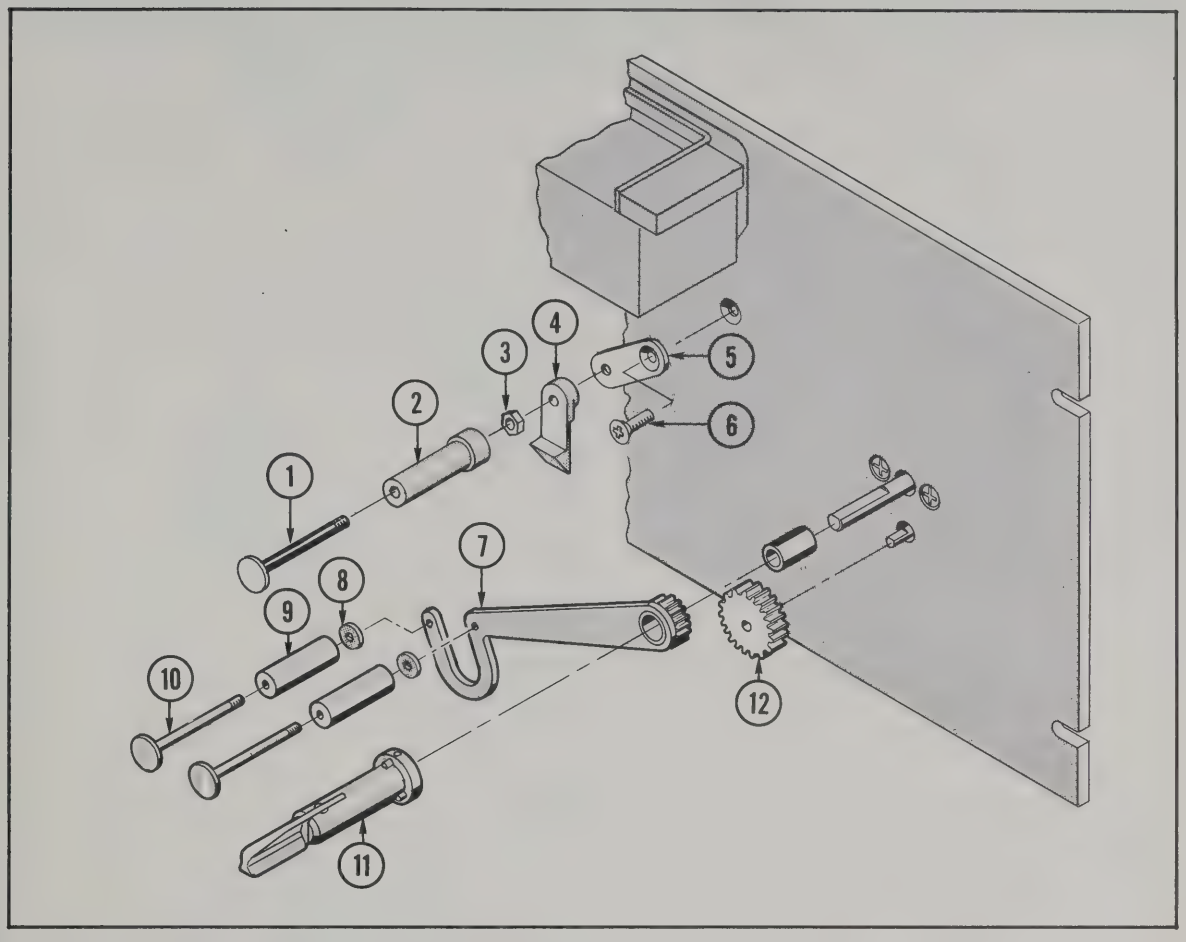


Figure 27
Exploded View

Index	Part Number	Description
	345470	Tape Tension Arm Assembly, R.H. AND
	345471	Tape Tension Arm Assembly, L.H.
		CONSISTING OF:
7	319820	Tension Arm w/Gear #320030 attached
8	347900	Spacer
9	345520	Roller
10	346280	Shaft, Roller
11	229490	Adapter, Reel
12	309660	Gear, Brake Shaft

PARTS LIST

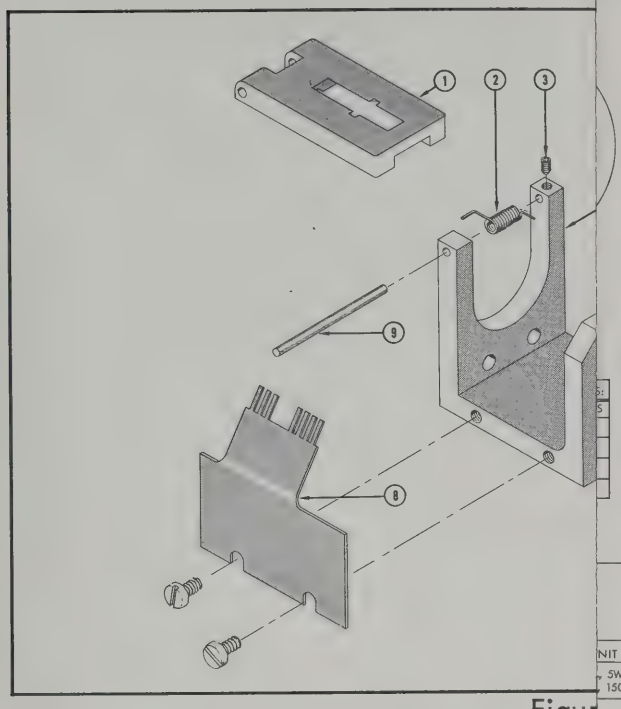
Outboard Bearing Block Assembly

Index	Part Number	Description
1	217730	Guard, Tape
2	139540	Spring, Torsion
3	4153900	Screw, #4-40 x 1/8", Socket Head, Cup Point
4	4159100	Screw, #6-32 x 1/4", Pan Head, Slotted
5	513840	Block, Outboard Bearing
6	217242	Plate, Stripper, R.H.
7	304192	Bushing, #B34-2
8	217241	Plate, Stripper, L.H.
9	139530	Pin, Hinge
	226220	Outboard Bearing Block -- Complete Assembly

Outboard Bearing Block Assembly w/End-of-Tape Switch

Index	Part Number	Description
1	Vendor	Screw -- Part of Switch Actuator, Index #4
2	Vendor	Washer -- Part of Switch Actuator, Index #4
3	4154600	Screw, #4 x 3/16", Self-Tap, Pan Head, Slotted
4	4077300	Actuator, Switch
5	220631	Plate, Stripper, L.H.
6	4077100	Microswitch, #1SX1-T
7	Vendor	Insulator -- Part of Switch Actuator, Index #4
8	146120	Block, Switch Mounting
9	220621	Guide, Tape Pressure, L.H.
10	513840	Block, Outboard Bearing
11	139540	Spring, Torsion
12	220680	Guard, Tape
13	4153900	Screw, #4-40 x 1/8", Socket Head, Cup Point
14	220622	Guide, Tape Pressure, R.H.
15	139530	Pin, Hinge
16	4151800	Screw, #2-56 x 3/16", Binding Head, Slotted
17	4159100	Screw, #6-32 x 1/4", Pan Head, Slotted
18	220632	Plate, Stripper, R.H.
19	304192	Bushing, #B34-2
	226330	Outboard Bearing Block w/EOT -- Complete Assembly

Outboard Bearing



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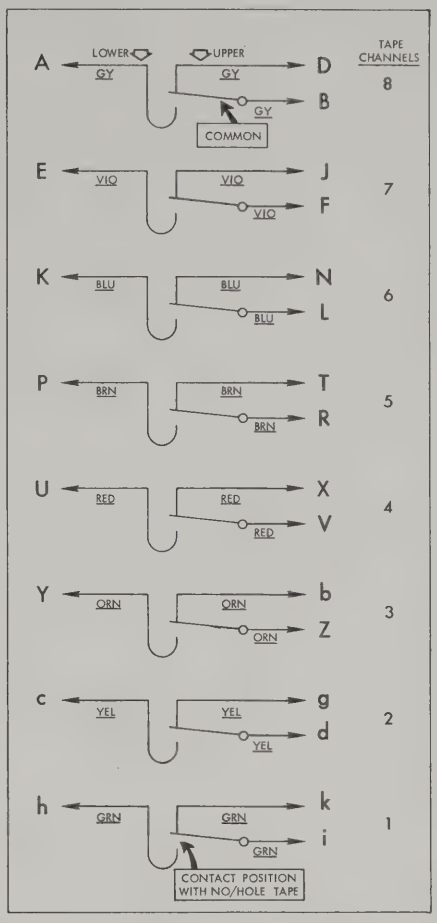
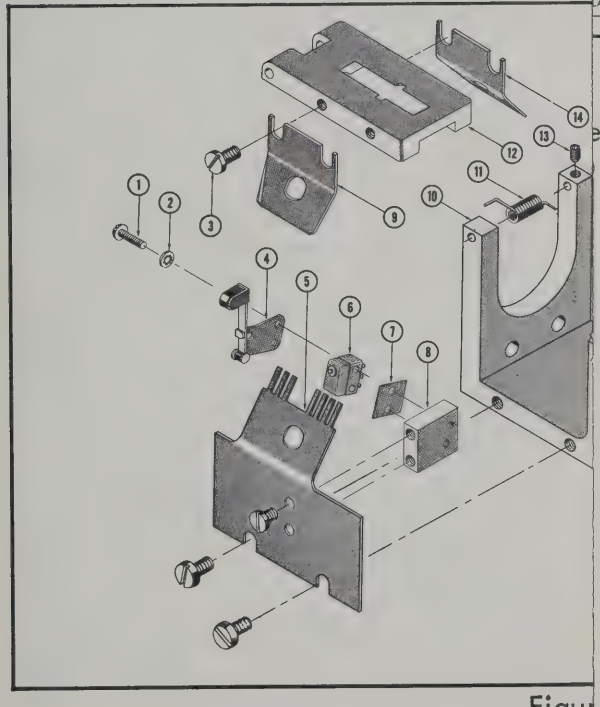


Outboard Bearing Block Asse



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PARTS LIST

Outboard Bearing Block Assembly

Index	Part Number	Description
1	217730	Guard, Tape
2	139540	Spring, Torsion
3	4153900	Screw, #4-40 x 1/8", Socket Head, Cup Point
4	4159100	Screw, #6-32 x 1/4", Pan Head, Slotted
5	513840	Block, Outboard Bearing
6	217242	Plate, Stripper, R.H.
7	304192	Bushing, #B34-2
8	217241	Plate, Stripper, L.H.
9	139530	Pin, Hinge
	226220	Outboard Bearing Block -- Complete Assembly

Outboard Bearing Block Assembly w/End-of-Tape Switch

Index	Part Number	Description
1	Vendor	Screw -- Part of Switch Actuator, Index #4
2	Vendor	Washer -- Part of Switch Actuator, Index #4
3	4154600	Screw, #4 x 3/16", Self-Tap, Pan Head, Slotted
4	4077300	Actuator, Switch
5	220631	Plate, Stripper, L.H.
6	4077100	Microswitch, #1SX1-T
7	Vendor	Insulator -- Part of Switch Actuator, Index #4
8	146120	Block, Switch Mounting
9	220621	Guide, Tape Pressure, L.H.
10	513840	Block, Outboard Bearing
11	139540	Spring, Torsion
12	220680	Guard, Tape
13	4153900	Screw, #4-40 x 1/8", Socket Head, Cup Point
14	220622	Guide, Tape Pressure, R.H.
15	139530	Pin, Hinge
16	4151800	Screw, #2-56 x 3/16", Binding Head, Slotted
17	4159100	Screw, #6-32 x 1/4", Pan Head, Slotted
18	220632	Plate, Stripper, R.H.
19	304192	Bushing, #B34-2
	226330	Outboard Bearing Block w/EOT -- Complete Assembly

Outboard Bearing Block Assembly

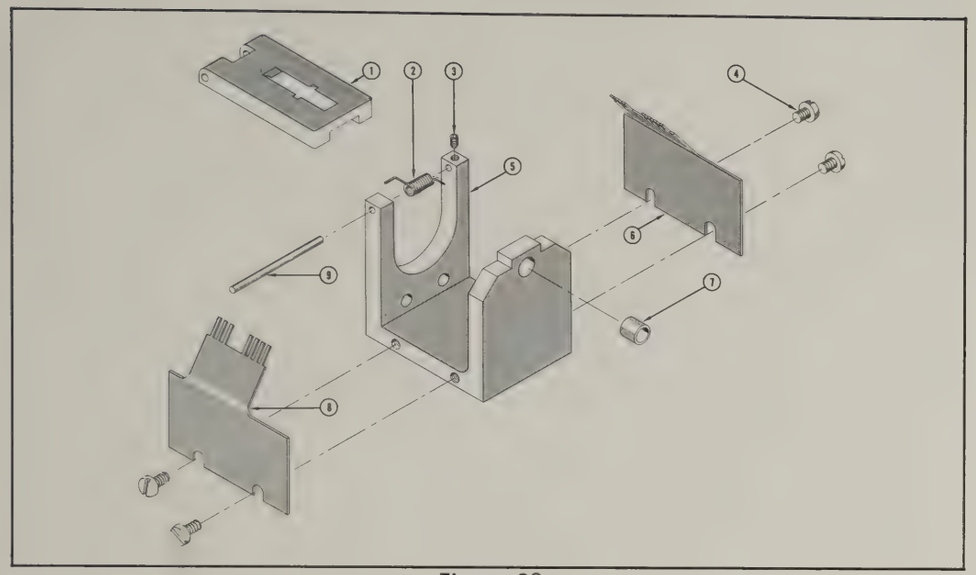

Figure 28
Exploded View

Outboard Bearing Block Assembly w/End-of-Tape Switch

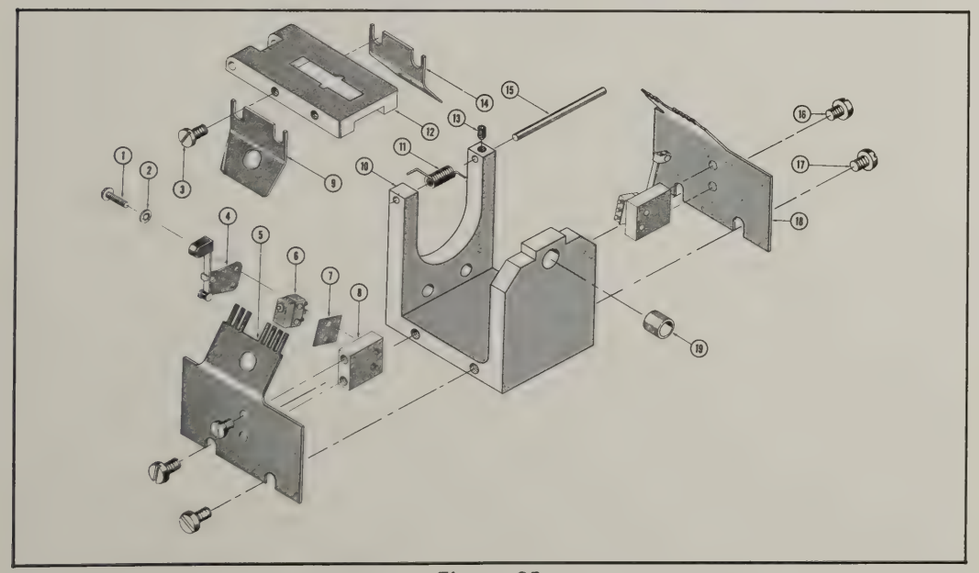

Figure 29
Exploded View

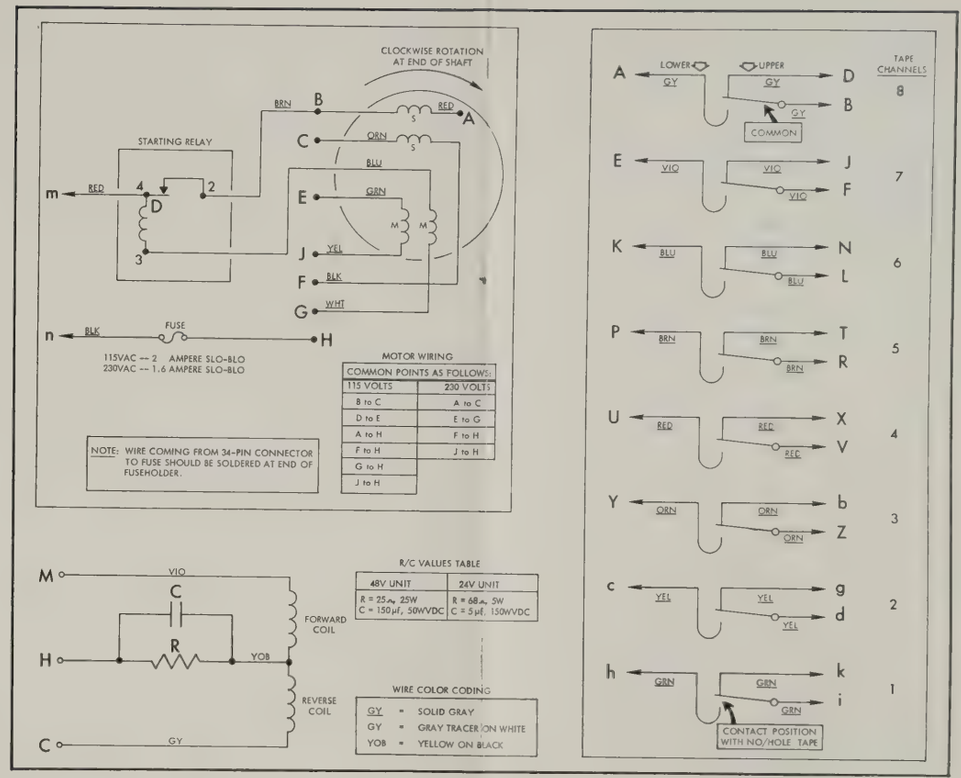

Figure 30
Wiring Diagram

Warranty

Tally Corporation warrants its equipment to be free from defect in materials and workmanship. Tally's sole obligation, under this warranty is to bear the cost of parts and labor for the repair or replacement of equipment which fails to meet the applicable Tally specification within three (3) months after installation by the end user; and to bear the cost of the parts only, for any repair made to the equipment for an additional nine (9) months.

Notice of installation must be given by returning the postpaid card which accompanies the equipment. If said card is not returned to Tally within fifteen (15) days following installation, the warranty shall be considered to have begun at time of shipment from the Tally plant. The date of installation shall be subject to verification by an employee or representative of Tally Corporation.

This warranty includes a maximum allowable shelf life of six (6) months, so that the parts and labor coverage terminates, in any event, nine (9) months following shipment from the Tally plant; and the parts only coverage terminates, in any event, eighteen (18) months following shipment from the Tally plant.

This warranty does not extend to any Tally products which have been subjected to misuse, neglect, accident, improper installation or application, or failure to follow a required lubrication schedule where specified in the manual.

For service under this warranty, call the nearest Tally authorized service agency listed in the equipment manual. All requests for service should refer to the model and serial number of the equipment.

The above warranty to repair or replace defective equipment is in lieu of all other warranties, express or implied, statutory or otherwise and Tally Corporation shall not be liable for damages or delays.

TALLY CORPORATION
1310 Mercer Street
Seattle, Washington 98109

TALLY

TALLY CORPORATION

FIELD SERVICE PROGRAM

The EDPS Division of RCA Service Company is Tally's National Service Agent. Service is also available in a number of cities where our sales representatives each maintain one or more full-time trained service personnel. In addition to this coverage, service locations are maintained in over a dozen other countries. A list of these sites is on the other side of this page.

To arrange service through RCA, find the city listed nearest you, regardless of state boundaries. The number in parentheses represents the district office serving you. The key at the bottom of the list identifies this office and its telephone number. Call the district office, collect. The district manager will provide service from the nearest available serviceman. He will also provide emergency service phone numbers, and in general set up service arrangements according to your needs. After the initial call to the district office, make all routine service requests to the local office supplying the actual service capability.

Requests for service by our sales representatives should be directed to the Service Manager at the appropriate office listed under U. S. SALES REPRESENTATIVES, on the reverse side of this page.

Routine requests for spare parts only should be directed to Tally Corporation, 1310 Mercer Street, Seattle, Washington 98109. Emergency spare parts are available through the nearest RCA sales representative's service office.

ALABAMA

Birmingham	(1)
Mobile	(8)

ARIZONA

Tucson	(7)

CALIFORNIA

Belmont	(13)
Burbank	(7)
City of Commerce	(7)
Culver City	(7)
El Segundo	(7)
Gardena	(7)
Hollywood	(7)
Inglewood	(7)
Los Angeles	(7)
Millbrae	(13)
Redding	(13)
Sacramento	(13)
San Bernadino	(7)
San Carlos	(13)
San Diego	(7)
San Francisco	(13)
Sunnyvale	(13)
Van Nuys	(7)

COLORADO

Aurora	(12)
Denver	(4)

CONNECTICUT

Bloomfield	(6)
Fairfield	(6)
Hartford	(6)
New Haven	(6)

FLORIDA

Coral Gables	(8)
Ft. Lauderdale	(8)
Jacksonville	(8)
Miami	(8)
Orlando	(8)
Pensacola	(8)
Tallahassee	(8)
Tampa	(8)
West Hollywood	(8)
West Palm Beach	(8)

GEORGIA

Atlanta	(1)
Ft. McPherson	(1)
Macon	(8)
Marietta	(1)

HAWAII

Honolulu	(13)

ILLINOIS

Arlington Heights	(3)
Belleville	(12)
Bloomington	(3)
Champaign	(3)
Chicago	(3)
E. Alton	(12)
Joliet	(3)
Melrose Park	(3)
Moline	(3)
Rock Island	(3)

INDIANA

Evansville	(3)
Indianapolis	(3)
La Porte	(3)
Wabash	(3)

IOWA

Davenport	(3)

KENTUCKY

Louisville	(1)

LOUISIANA

New Orleans	(8)
Shreveport	(8)

MARYLAND

Baltimore	(14)
Camp Spring	(14)
Ft. Meade	(14)
Indian Head	(14)

MASSACHUSETTS

Andover	(6)
Boston	(6)
Burlington	(6)
Cambridge	(6)
Chicopee Falls	(6)
Lowell	(6)
Pittsfield	(6)
Reading	(6)
Springfield	(6)
Waltham	(6)
Watertown	(6)

MICHIGAN

Benton Harbor	(3)
Battle Creek	(5)
Detroit	(5)
Highland Park	(5)
Lansing	(5)
St. Joseph	(3)
Warren	(5)

MINNESOTA

St. Paul	(3)

MISSISSIPPI

Jackson	(8)

MISSOURI

Clayton	(12)
Kansas City	(12)
St. Louis	(12)

NEBRASKA

Lincoln	(12)
Omaha	(12)

NEW JERSEY

Atlantic City	(2)
Camden	(2)
Cranford	(11)
Deptford	(2)
Haddon Heights	(2)
Harrison	(11)
Moorestown	(2)
Morristown	(11)
Newark	(11)
Paterson	(11)
Perth Amboy	(11)
Princeton	(11)
Rahway	(11)
Teaneck	(11)
Trenton	(11)

NEW MEXICO

Albuquerque	(4)

NEW YORK

Corning	(11)
Horseheads	(11)
Jamaica	(9)
New York City	(9)
Rome	(11)
Syracuse	(11)

NORTH CAROLINA

Asheboro	(14)
Charlotte	(1)
Cherry Point	(14)
Raleigh	(14)

OHIO

Akron	(5)
Alliance	(5)
Canton	(5)
Cincinnati	(5)
Cleveland	(5)
Columbus	(5)
Dayton	(5)
Hannibal	(10)
Newark	(5)
Toledo	(5)

OKLAHOMA

Midwest City	(4)

OREGON

Portland	(13)

PENNSYLVANIA

Beaver Falls	(10)
Bridgeville	(10)
Harrisburg	(2)
Lancaster	(2)
Middletown	(2)
Midland	(10)
Paoli	(2)
Philadelphia	(2)
Pittsburgh	(10)
Springfield	(2)
Swarthmore	(2)

RHODE ISLAND

Providence	(6)
Quonset Point	(6)

SOUTH CAROLINA

Charleston	(1)
Columbia	(1)
Landrum	(1)

TENNESSEE

Memphis	(1)
Nashville	(1)

TEXAS

Dallas	(4)
Iowa Park	(4)
San Antonio	(4)

UTAH

Ogden	(4)

VIRGINIA

Ft. Belvoir	(14)
Ft. Lee	(14)
Hampton	(14)
McLean	(14)
Norfolk	(14)

WASHINGTON

Seattle	(13)

Washington, D. C.	(14)

KEY (RCA DISTRICT OFFICES)

1. Atlanta, Georgia (404-525-8359)
2. Camden, New Jersey (609-663-4680)
3. Chicago, Illinois (312-346-1761)
4. Dallas, Texas (214-351-5361)
5. Detroit, Michigan (313-353-3650)
6. Hartford, Connecticut (203-527-7158)
7. Los Angeles, California (213-461-9215)
8. Miami, Florida (305-444-2583)
9. New York City, N. Y. (212-944-5575)
10. Pittsburgh, Pennsylvania (412-261-1080)
11. Rahway, New Jersey (201-381-4000)
12. St. Louis, Missouri (314-726-5328)
13. San Francisco, California (415-981-7785)
14. Washington, D. C. (202-337-8500) Ext. 533

U. S. SALES REPRESENTATIVES

(with service facility)

MOXON ELECTRONICS CORPORATION

Los Angeles, California (213-272-9311)

INSTRUMENT ASSOCIATES

Hartford, Connecticut (203-246-5686)
Arlington, Massachusetts (617-648-2922)

PIVAN ENGINEERING COMPANY

Chicago, Illinois (312-539-4838)

S. STERLING COMPANY

Detroit, Michigan (313-442-5656)
Pittsburgh, Pennsylvania (412-884-5515)
Cleveland, Ohio (216-442-8080)

SBM ASSOCIATES, INC.

Elmsford, New York (914-592-8850)
Rochester, New York (716-271-7430)

INTERNATIONAL SERVICE LOCATIONS

ARGENTINA

COASIN S. A.
Virrey del Pino 4071
Buenos Aires

AUSTRALIA

SAMPLE ELECTRONICS (VIC.) PTY. LIMITED
9-11 Cremorne Street
Richmond E. 1
Victoria

BELGIUM

NUCLEAR DATA EUROPE
Building #112
Schiphol Airport
Amsterdam, Netherlands

BRAZIL

AMBRIEX, S. A.
Av. Graca Aranha 226
Rio de Janeiro

CANADA

R-O-R ASSOCIATES, LIMITED
1470 Don Mills Road
Don Mills, Ontario

R-O-R ASSOCIATES, LIMITED
3285 Cavendish Boulevard
Montreal 28, Quebec

DENMARK

TEL INTER AKTIEBOLAG
Filipstadsbacken 48
Fack 59, Farsta 1
Stockholm, Sweden

FINLAND

TEL INTER AKTIEBOLAG
Filipstadsbacken 48
Fack 59, Farsta 1
Stockholm, Sweden

FRANCE

IMPRESSION ENRIGISTREMENT DES RESULTATS
6, rue Blondel
Courbevoie
Seine

GERMANY

TECHNICAL MEASUREMENT CORPORATION-GmbH
Mainzer Landstrasse 51
6 Frankfurt/Main 1
Frankfurt

GREECE

MARIOS DELLEGGIO REPRESENTATIONS
2, Alopekis Street
Athens 139

ISRAEL

EASTRONICS, LIMITED
75 Haifa Road
P. O. Box 21029
Tel Aviv

ITALY

PRODEST ELETTRONICA
Via Achille Grandi, 23
Cinisello Balsamo (MI)
Milano

JAPAN

MITSUBISHI SHOJIKAISHA, LIMITED
P. O. Box 22, Tokyo Central
20 Marunouchi, 2-Chrome
Chiyoda-Ku, Tokyo

NETHERLANDS

NUCLEAR DATA EUROPE
Building #112
Schiphol Airport
Amsterdam

NEW ZEALAND

SAMPLE ELECTRONICS (N.Z.) LIMITED
8 Matipo Street
Onehunga S. E. 5
Auckland

NORWAY

TEL INTER AKTIEBOLAG
Filipstadsbacken 48
Fack 59, Farsta 1
Stockholm, Sweden

SWEDEN

TEL INTER AKTIEBOLAG
Filipstadsbacken 48
Fack 59, Farsta 1
Stockholm

SWITZERLAND

MUNZIG INTERNATIONAL, INC.
6 Av. de Frontenex
1207 Geneva

UNITED KINGDOM

(England, Scotland, Wales,
Northern Ireland, Irish Free State)

AUTOMATIC PUNCHED TAPE LIMITED
6a George Street
Croydon, Surrey
England

TALLY EUROPE LIMITED
Radnor House
1272 London Road
London S. W. 16, England

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